COAL AGE

A McGRAW-HILL PUBLICATION

JANUARY, 1959

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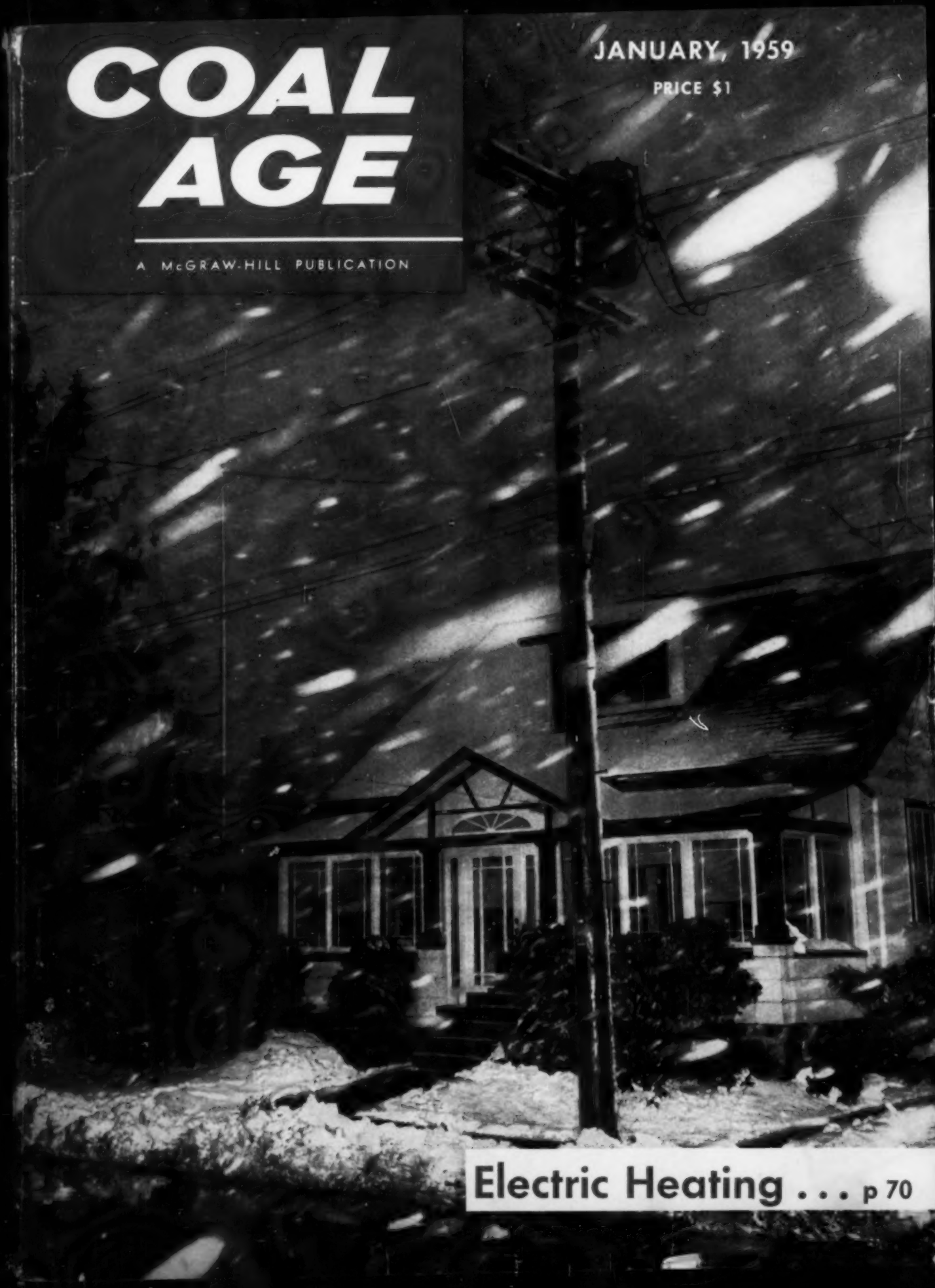

Electric Heating . . . p 70

MSA's continuous MinePhone research and development assures dependable underground communication in mines and areas previously thought inaccessible for this type of equipment.

Built-in → quality here

increases safety and dependability here

The motorman has clear, instant voice communication with the dispatcher or other motormen while trips are moving.

M-S-A MinePhone helps mine operators gain and maintain fast, high-capacity haulage schedules

Briefly, here's how the M-S-A® MinePhone helps keep haulage schedules abreast of production in today's mechanized mines.

The MinePhone coordinates trip traffic for safe, fast, productive haulage control. Trip control avoids excessive power loads for economical operation. Assures better distribution of cars for peak loading efficiency.

Further, a MinePhone system reduces frequency of motormen and trip riders getting on and off trips. This saves time. Minimizes chances of injury. Reduces wear and tear on haulage equipment caused by excessive stopping and starting.

Finally, the MinePhone speeds up operations of maintenance crews. Provides an efficient, time-saving underground call system. Keeps main line haulageways free of time-consuming traffic tie-ups.

Your MSA representative would be pleased to arrange a demonstration for you. Call him in for an evaluation of your communication needs. And write us for informative literature on the MinePhone.

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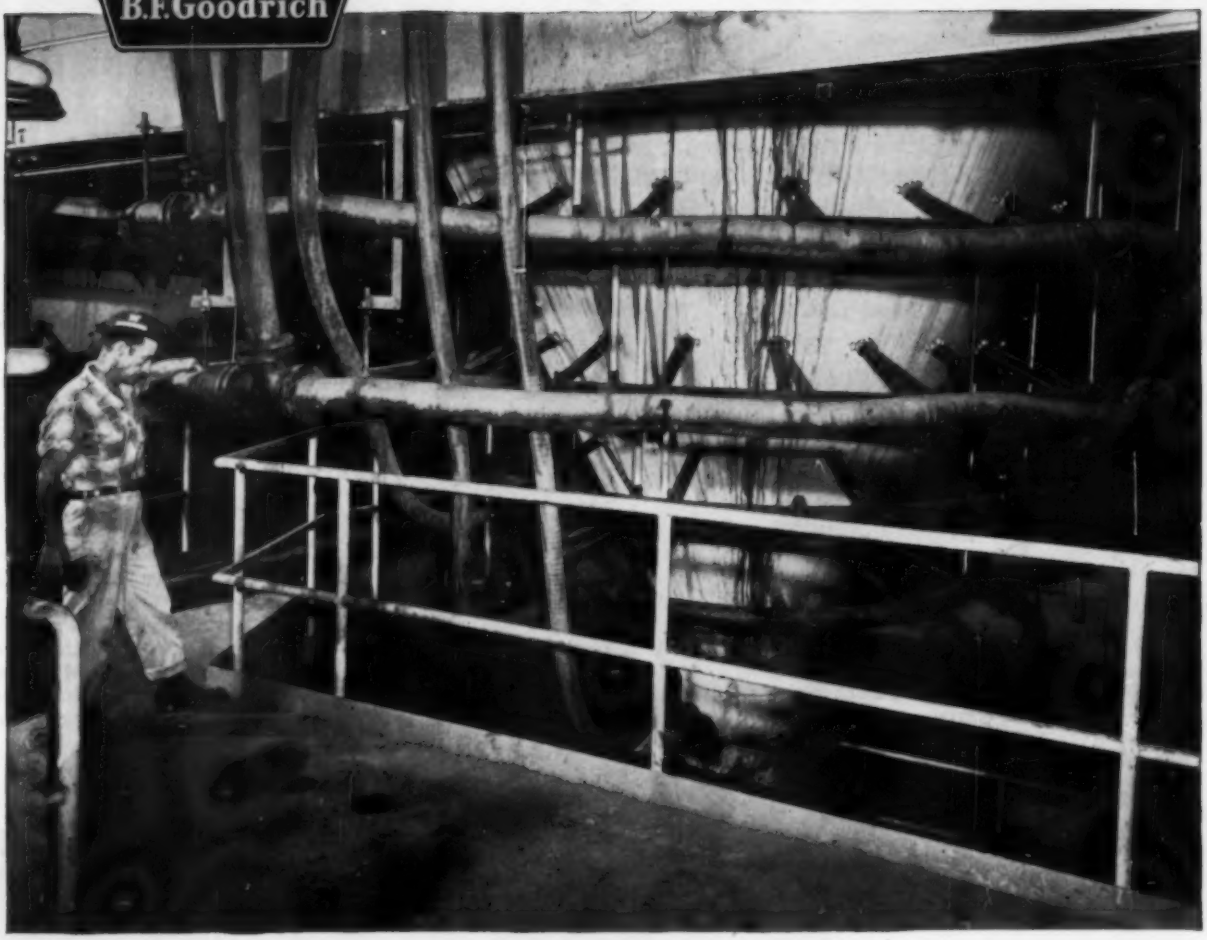
MSA® SAFETY EQUIPMENT HEADQUARTERS

B.F.Goodrich



Automatic washing machine scrubs with swirling sand

B.F.Goodrich improvements in rubber brought extra savings

Problem: That cone-shaped tank is a washing machine in a coal mine. Its job is to make sure users get all coal, no unburnable rocks in their furnaces. A torrent of sand and water—15,000 gallons a minute—circulates in and out of the tank. As coal swirls through this thick mixture, rock and shale sink to the bottom, are drained away. The coal, being lighter, is skimmed off the top.

But how to pipe the sandy mixture in at different levels was a problem. It would wear holes through metal pipe in no time.

What was done: Company engineers remembered that a rubber hose developed by B.F.Goodrich had given unusually good service handling rough materials in another installation. This hose is made with a special lining of the toughest wear-resisting rubber known. The rubber is so rugged that on many jobs it outlasts the hardest steel 10 to 1.

Savings: Some 42 lengths of B.F. Goodrich rubber hose were installed. You see several sizes of it in the picture, delivering sand and water to the tank. The coal company's chief engineer expects this hose to last six or seven years—many times longer than pipe.

Where to buy: Your B.F.Goodrich distributor has the exact specifications for the B.F.Goodrich hose described here. And, as a factory-trained specialist in rubber products, he can answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Dept. M-497, Akron 18, Ohio.*

B.F.Goodrich *industrial rubber products*

NEW JOY 6-CM C

produces 5½ tons per minute
works in coal 5½ to 10 feet

The new Joy 6-CM is an entirely new machine, 48″ high, with every feature engineered into it to accomplish higher tonnage and lower maintenance cost.

The gathering arm clean-up, and the conveyor are each powered independently of the ripper head . . . the Miner can do auxiliary clean-up while the shuttle cars are changing. The coal is stored on the conveyor for immediate unloading.

Extra-wide crawler treads and extra-high ground clearance make the 6-CM sure-footed on the poorest bottom. The crawlers are gear-driven for fast tramming . . . 85 fpm.

If you are operating a coal seam 65″ and higher talk to a Joy engineer about the 6-CM, the newest continuous miner on the market. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

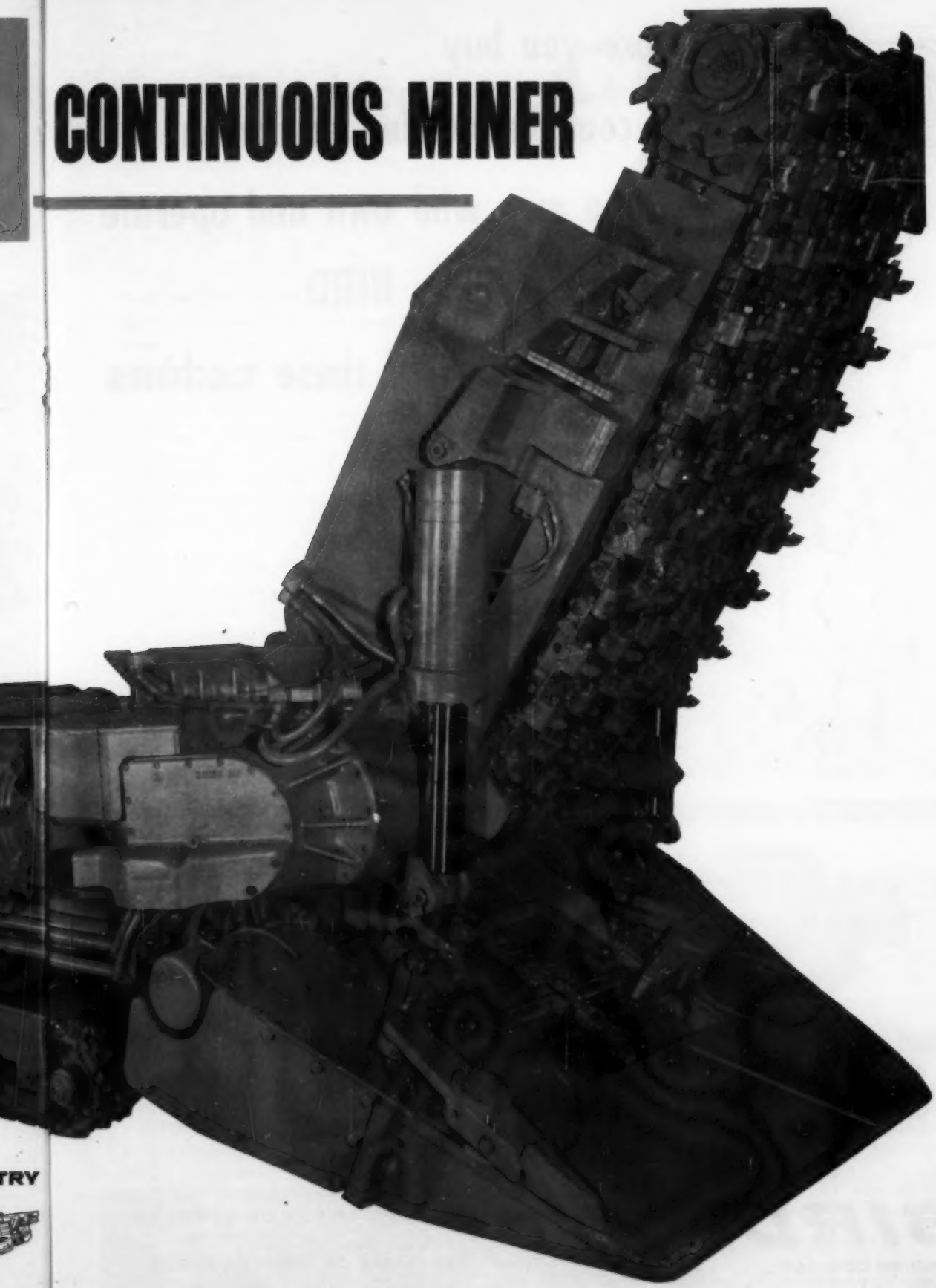
AC

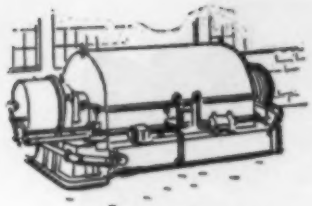
The new 6-CM is available with AC or DC.

JOY EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY

WSW C 7279-571

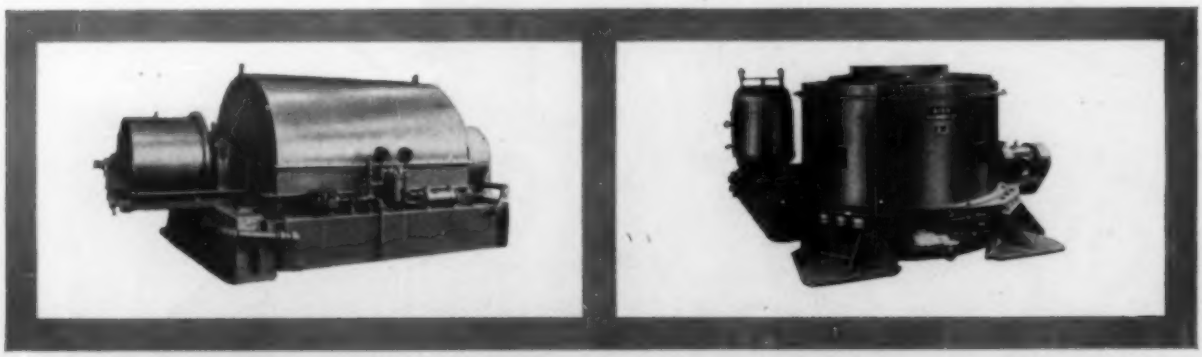
CONTINUOUS MINER





Before you buy fine coal dewatering equipment ask the men who own and operate machines built by BIRD what they think of these machines and their builders

- for quality of design and construction
- for ability to deliver well dried coal and more of it per day at lower cost per ton
- for the *follow-through* that assures the right machine for the job, properly installed, correctly operated, properly maintained, for all the long time they stay on the job



The Bird Solid Bowl Centrifugal Coal Filter dewaters fine coal for six cents or less per ton, including write-off, power and maintenance. It is ideal for handling minus 28 mesh coal from thickeners or cyclones.

The Bird-Humboldt Oscillating Screen Centrifuge delivers ¼" x 28 mesh coal with as little as 5% surface moisture, with almost no degradation and almost no loss of solids. Screen life may be 3000 hours or more; power input only ¼ HP per ton.

BIRD
MACHINE COMPANY

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This Month in COAL AGE

JANUARY 1959

Features This Month:

Editorials: Electric Coal—Computers Too ..... p 69
Electric Heat Comes of Age ..... p 70
Digging Deeper at Lower Cost ..... p 82
Miniature Equipment Boosts Production In Low-Coal Mines ..... p 86
Motivation—A Management "Must" ..... p 90
Benefits and Control of Multiple-Fan Ventilation ..... p 96
High-Tonnage Punch Mining at Chafin Coal ..... p 104
Coal Mining Institute of America ..... p 110

Departments This Month:

Coal Commentator . p 11 — News Roundup . . . p 26
Foremen's Forum . p 114 — Operating Ideas . . p 118
Equipment Developments . . . p 122

► Market Development

Electric Heat Comes of Age ..... *p 70*

W. A. Raleigh Jr., Associate Editor, *Coal Age*

Electric utilities have decided to make electric space heating the central building block for future growth. Behind the decision: The need to offset the trend to higher summer peaks; availability of a full line of equipment; widening consumer acceptance in all climates; and recognition that electric heat holds no peer as a wedge to the all-electric home and increased per capita consumption. Meaning to coal: A prime opportunity to boost utility tonnage and recover retail losses.

Featured—Special reports from coal-burning utilities; how electric heat works; electric heat solves a wintertime headache.

► Strip Mining

Digging Deeper at Lower Cost ..... *p 82*

To cut operating costs while digging to higher banks, Hart & Hart Coal Co., Providence, Ky., relies on new techniques and flexibility of operation. Major stripping machines include 14- and 7-yd draglines and a 5½-yd shovel. A bulldozer with hydraulic ripper adds flexibility by ripping overburden and coal in addition to moving spoil. The company mixes its own blasting agent, using a combination of carbon black and fuel oil with ammonium nitrate. Better storage and water resistance are noted when the three ingredients are used. Whenever possible, the company uses explosives to move as much overburden as possible—sometimes 25% of the material.

Extras—How shovel performance was improved; benefits of constant-pressure hydraulic pump on bulldozer.

(Continued on p 7)

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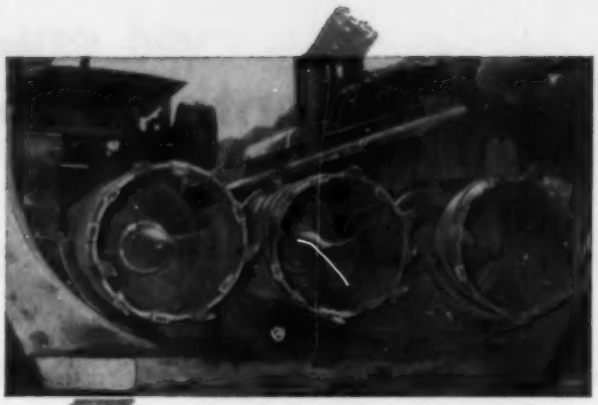
COMPTON
"Triple Head"
COAL AUGER



SMASHES THE THIN SEAM BARRIER!

RECOVERS LOST TONNAGE!

AS THIN AS 24 INCHES

AS DEEP AS 200 FEET

They said it couldn't be done—all-out coal recovery from the thin seam—economically and profitably!

Then the Compton "Triple Head" Coal Auger smashed the barrier by supplying the stopper to the profits that got away—those tons and tons of coal in the thin seam, way back under.

The Compton "Triple Head" Coal Auger moves along the working face of the highwall! Its three cutting heads operate in unison, boring as deep as 200 feet, augering up to 58 tons of clean, saleable coal from a 24" seam in an hour! And the Compton "Triple Head" Coal Auger assures maximum recovery too, drilling within 4¾" of the bottom of the cutting heads, regardless of size!

Seam thickness makes no difference to the Compton "Triple Head" Coal Auger! It drills a double row of over-lapping holes as easily as a single row.

Why not phone for a Compton auger mining specialist today? He will analyze your property and determine if it calls for a "Triple," "Double" or "Single" Head Coal Auger!

Compton, Inc.

CLARKSBURG, WEST VIRGINIA

WHEN LOOKING FOR AUGERS — LOOK TO COMPTON

► Deep Mining

Miniature Equipment Boosts Production In Low-Coal Mines ..... p 86

Small, rubber-tired tractors and trailers, for use in seams as thin as 24 in, provide a battery-powered haulage system for small truck mines. Cutting machines are 18 in high. Each machine makes about seven cuts per shift, enough to provide 84 loads for the 1¾-ton trailers. Operations such as these are carried on by RB Coal Co., Grundy, Va., which entered the mining business in 1951 on a small investment.

Highlight—Explanation of mining system for miniature machines.

► Employee Relations

Motivation—A Management "Must" .... p 90

R. B. Hewes, Professor, Mineral Industries Extension, Pennsylvania State University, University Park, Pa.

Machines are built and controlled by men, and will do no more than the men want them to do. Human beings do productive work in a pattern corresponding to their will to do so, or, according to the extent of their motivation. Management's problem of motivation resolves into two parts: (1) motivation of a group, which may be satisfied by policy or broad agreements and (2) motivation of the individual, based upon the experiences and knowledge which places the individual apart from the group. The first is a responsibility of executive management, while the second is a responsibility of immediate supervisors.

Checklist—The elements of motivating people to do their best.

► Ventilation

Benefits and Control of Multiple-Fan Ventilation ..... p 96

J. A. Boyle, Chief Mine Inspector, and **O. S. Conn,** Ventilation Engineer, Frick Dist., U. S. Steel Corp., Uniontown, Pa.

Ventilating air at U. S. Steel's Robena mine is provided by one blowing and seven exhaust fans. All intakes are common to all fans; separation doors in main returns create the main splits. Self-closing doors at all upcast shafts prevent air-reversal in the event of fan stoppage. Robena's ventilation standards include (1) two-split section ventilation, (2) emergency-door and regulator arrangements to provide smoke-free escape routes from sections in case of emergency, (3) maximum allowable methane concentration of 0.5% in the

(*Continued on p 9*)

This Month in COAL

BITUMINOUS IN 1959—Withdrawals from stocks of around 20 million tons, combined with major drops in coal use and exports, and lesser declines in other categories, cut bituminous production to barely 400 million in 1958, even though consumption plus exports was around 420 million. For 1959, on the basis of first-of-the-year estimates, consumption will total up to 450 million tons, with production approximately the same. Among those agreeing on this consumption figure are G. A. Lamb, of Consol, and Appalachian Coals, Inc. Their individual estimates are compared in the following table:

Bituminous Consumption Forecast, 1959

	Lamb	ACI
Electric utilities	163	162,000
Coke plants—coking coal	107	100,000
Railroads	4	2,000
Other industrial—industrial steam	103	103,000
Total industrial	377	367,000
Bunker	...	900
Retail deliveries	32	36,000
U. S. Consumption	409	403,900
Exports to Canada	16	15,500
Exports overseas	25	30,000
Total	450	449,400
Stocks, etc.	...	+1,000
Production	...	450,400

This estimated production of 450 million in 1959 compares with 400 million in 1958 and 493 million in 1957.

ANTHRACITE IN 1959—Except for a few weeks, anthracite in 1958 ran 100 to 200,000 tons a week under 1957 figures, ending the year with a total of around 21 million. U. S. consumption held up fairly well, particularly in the industrial category, and around half the loss was in exports. A mixture of influences will shape the picture for 1959. The final result may range from another decline to a total equal to 1958.

COMPETITION IN 1959—The biggest trouble coal will encounter in 1959 competitive-wise will be natural gas. Lines based on U. S. supplies are still being extended and the drive to bring in Canadian gas will be stepped up. The oil problem, on the other hand, probably will not be any greater than in past years, though this by no means implies that it will not remain troublesome. Rainfall will determine the hydro level, and chances are that it will be much less than in 1958. Nuclear competition will remain negligible, but not the pressure to get the government in deeper.

COAL IN 1959—Bituminous entered 1959 with a higher price level, by 35 to 50c, than in 1958, and new rises were in the cards for anthracite, with corresponding reduction in competitive power where price is the consideration. But investments to increase efficiency are expected to play their usual role of preventing any additional rises and probably making it possible to get back to the 10-yr average of around $5 for bituminous value by the end of the year.

ENEMY OF WEAR,
DOWN TIME AND WASTE
AT BUCKHORN MINE

Processing plant of Bell & Zoller's Buckhorn Mine, Johnston City, Illinois uses STANOLITH Grease MP.

STANOLITH GREASE MP

Situation: As with every underground mine, equipment at Buckhorn Mine is susceptible to wear unless moving parts are protected with a grease film that stays in place regardless of heat, water or dirt.

What was done: Buckhorn Mine management knew where to turn for assistance on lubrication and experienced advice on how to protect equipment from wear. They called on Standard Oil mine lubrication specialist Hervie Dillingham. Hervie recommended STANOLITH Grease MP. This lithium grease is particularly suited to mine lubrication jobs because of its (1) ability to shield parts from grit and dirt, (2) resistance to both high and low temperatures and (3) resistance to water wash out. STANOLITH Grease MP holds its consistency even under the severe working conditions encountered in the lubrication of mine equipment. With its ability to provide lubrication over a wide range of applications, fewer greases need to be inventoried. One drum of grease instead of many different ones reduces costs, saves handling on the job, eliminates application mistakes.

What you can do: Let a Standard Oil lubrication specialist help you find ways to eliminate your lubrication problems. One of these men is on the staff of each of the 48 district offices in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You've got to get down there to see the problem. Standard's Hervie Dillingham does just that. Hervie has experience and training to know what's needed. He has been providing technical service to mines for more than 20 years.

Quick facts about
STANOLITH Grease MP

- Capable of providing superior lubrication over a wide range of applications
- Water resistant
- High temperature resistant
- Pumpable in grease gun or pressure system
- Mechanically stable

YOU EXPECT MORE FROM **STANDARD** *AND YOU GET IT!*

return of any split and (4) minimum allowable volume of 10,000 cfm on haulage roads.

Study Pieces—Coded diagrams show effects of fan stoppages on mine ventilation.

► Highwall Mining

High-Tonnage Punch Mining at Chafin Coal ..... *p 104*

Average output from highwall mining at No. 2 mine, Chafin Coal Co., Logan, W. Va., is 24 tons of clean coal per shift per man on the payroll. Operations are in the 42-57-in Cedar Grove seam, in which conventional equipment is used to recover panels measuring 5,000 ft along the highwall by 7,000 ft deep. Development precedes final recovery by about 6 mo. Mainline haulage and power transmission distances are limited to about 7,000 ft.

Features—Drilling powered by cutting machine.

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This Month in Mining Practice

ELECTRONIC SENSING — The electronic unit, which recently joined its earlier brethren in the sensing field as a means of checking density and thus leading to better control of dense-media cleaning, now is finding other applications. One is bin-level indication and control of feeding and discharging equipment. And along with the new are modifications of the older mechanical or electrical units, such as, for bin use, a slowly revolving wheel which is stopped when the material builds up to it, thus converting jamming into an asset.

CONTRACT MAINTENANCE—Signs continue to multiply that contracting maintenance and rebuilding of mining items and equipment down to and including tires and trailing cables is on the upswing. In addition to independents, the good ones of which are taking on more and more work, the list now includes more and more of the original builders of the machine or certain parts, such as, the motors. Reasons? When maintenance is contracted the investment and the headaches are transferred and the mining company is left freer to concentrate on production.

SPOILING BY SHOOTING—The idea of loading up holes and blasting a good portion of the spoil into the final disposal area is not new. However, the cost of drilling and explosives in earlier days usually made it cheaper to move the material with an excavator, even though some found it possible to move up to one-third or more of the first-cut spoil by shooting it over the hill.

High-footage drills and low-cost ammonium nitrate are bringing about another look at spoiling by shooting. Good results are foreseen by some operators where conditions are right.

ROOF BONDING—Recent news that the Bureau of Mines was preparing a new series of roof-bonding tests was paralleled by a word from one coal company reporting flat failure with attempts to inject a bonding agent into its top. But one failure is not regarded as the last word. Consequently, trials are being considered by other companies.

Footnote—Three manufacturers now install bolters on continuous miners at around $5,000 each. And one coal company, to get bolting to within 3 ft of the face in continuous mining, installs 2-ft temporary bolts and replaces them with full-length units later.

HELP FROM PLASTIC—The industry-old problem of moving air—which costs money—with a minimum of loss has been emphasized by the advent of continuous mining. The brattice line is one of the oldest coursing means and still is the widest used. Leakage is a major problem. Now, plastic sheeting is helping a number of operators with that particular difficulty.

Cleaning Out Corners—Getting gas out of corners and pockets, particularly with boring-type units, remains a problem even when leakage is reduced. So far, the best answer appears to be blowers and tubing, either alone or in combination with a small unit on the miner to sweep out the blind corner.

How Track Like This Helps Pare Down Mining Costs

Heavy rail, good grading and alignment, precision turnouts —these and all the other aspects of up-to-the-minute haulage track are evident in this mine. Long, heavy trips can really pour on the speed here, to help pare down the cost of bringing out coal.

One of the important factors behind the success of this mine-track operation is the planning put into it by Bethlehem trackwork engineers. They studied the mining plan and designed the layout that would best fulfill the requirements.

Such an approach results not only in smoothly efficient trackwork; it also shaves material and installation costs. That's because all Bethlehem trackwork is accurately pre-cut to size, curves are pre-formed to proper radii, and the various components are assembled on our own layout floor to assure a perfect fit at the job-site. Thus waste is eliminated and installation can proceed at a high rate of efficiency.

All this may sound expensive, but it really isn't. It's actually less costly than cut and try methods. Many mines believe that their Bethlehem trackwork has paid for itself many times over. If you have any changes or expansion in view, why not discuss your needs with a Bethlehem engineer? You can reach him through the Bethlehem office nearest you, or by writing direct to us.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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BETHLEHEM STEEL

The Coal Commentator

Fast and Continuous

Though it verges on being wearisome, it is hard to refrain from dwelling on the importance of transportation in attaining maximum efficiency in mining. The evidence comes not only from the "standard" mines—large and small—but also from the truck and punch mines, many in very-thin coal.

These operations have been the goals in the development of the small "trailing-cable" and battery-powered shuttle cars, and also the tractor-trail car system. One such operation is the subject of an article, one of several *Coal Age* has presented over the years, in this issue. One manufacturer reports sales of 670 tractors and locomotives to mines of all types in 15 states.

Results? They include, at one mine, 400 tons with twelve men in 5-ft coal, face to tipple; at another, with a 1,500-ft haul, 120 tons with nine men, 40-in coal; at another, 500-ft haul, 60 tons with five men, 28-in coal.

If you can get it away fast and continuously you can get high tons and low cost, whether the mine is little or big.

In Great Britain

City gas from coal, even though it has largely disappeared in the U. S., is by no means gone forever. In support, your commentator not only cites the May, 1958, issue of *Coal Age*, but also the action of the Midlands Gas Board, in England. **This board is starting construction of a $17 million Lurgi gasification plant with an estimated daily output of 30 million cu ft. A similar plant is under construction in Scotland.**

The situation is of course different in the U. S. and the day when manufactured gas will again be competitive probably has been put back by the recent Canadian discoveries and the stepped-up drive to export to this country. **But gas can be made from coal by any of a number of processes, including the Lurgi. This is a fact, leaving the only question that of what the timing will be. It is not necessarily the indefinite future.**

Strip Flying

Flying as a means of facilitating efficient mine planning and operation, though it has been done for many years, still has an era of major growth ahead. So notes Larry Cook, executive vice president of the Ohio Reclamation Association, in commenting on the article by Thomas J. Henderson, of Hanna, in the September issue of *Coal Age*.

Other operators in the area, Mr. Cook points out, have picked up the idea of using aerial checking for planning, carrying out and controlling strip operations, with the result that the association is now being stretched a little to meet the demand for the service. Reason? "The savings to the operator in aerial surveying and mapping are so great as to be almost unbelievable."

Flying Footnote: The helicopter has now been added to the list of aerial equipment used by mine operators, which list also includes the short takeoff plane. Credit for the helicopter first goes to Benson H. and Ralph G. Lingle, of the Lingle Coal Co., Clearfield, Pa.

How Much Net?

There are several standards for gaging the effectiveness of an organization in generating a profit. One is the percentage of gross income from sales finally realized after all charges and taxes. Some feel that the goal on this basis should be 10% or more, though perhaps more feel that 5% is good. Actually, many corporations with good ratings do not average 5%. But, as noted, for a really sound financial situation, some hold out for at least 5%.

How does coal measure up to this standard? Fairly well on the basis of reports of companies on the exchanges in late years. This reflects the change in management thinking over the years, as well as increasing size of company units and the like. One outstanding result of the change is the determination with which price-slashing has been avoided in recent depression months.

The benefits are incalculable. One is preservation of the industry's ability to generate a profit in the future—perhaps more than 10% in an increasing number of instances.

Trailing Cables

Is a major improvement in trailing cables, particularly for underground equipment, possible? And along with it, is a major improvement in cable maintenance cost in the cards?

The advent of AC has focused increased attention on both these questions. For both, the answer is of course "Yes," though the results may take time in some instances—but not necessarily in all. Recent experience, as an example, indicates that removing a cable and making a vulcanized repair as soon as the first failure occurs can cut maintenance cost in half compared to waiting until several field splices have been made.

Major design improvements are in the cards, but as always they can be completely translated into cost improvements only by proper application and maintenance practices. The latter still stands as one of the industry's big jobs.

Nothing fits **STRIP MINING**

like this fast, mobile 6-yd. *diesel-powered*

MANITOWOC!

See how this heavy, far-reaching Manitowoc Model 4500 dragline works right at the edge of the cut. That's real stability, paying off in full buckets with every pass. With a 120 ft. boom matched to a big 6-yd. bucket, your operator can remove more overburden from one spot with less frequent machine moves. ■ Added to this tremendous reach and capacity you get power to spare . . . supplied by the most simple, efficient drive in the industry. Job proven diesel power lets you work anywhere, unhampered by a trailing cable and expensive electric power installations. Plus benefits include a realistic initial cost, simple maintenance, fast disassembly for rail or trailer shipment; convertibility to a 5½-yd. shovel and a high trade-in value. ■ A call to your Manitowoc distributor will bring all the important details . . . contact him now for information on earliest delivery.

Manitowoc

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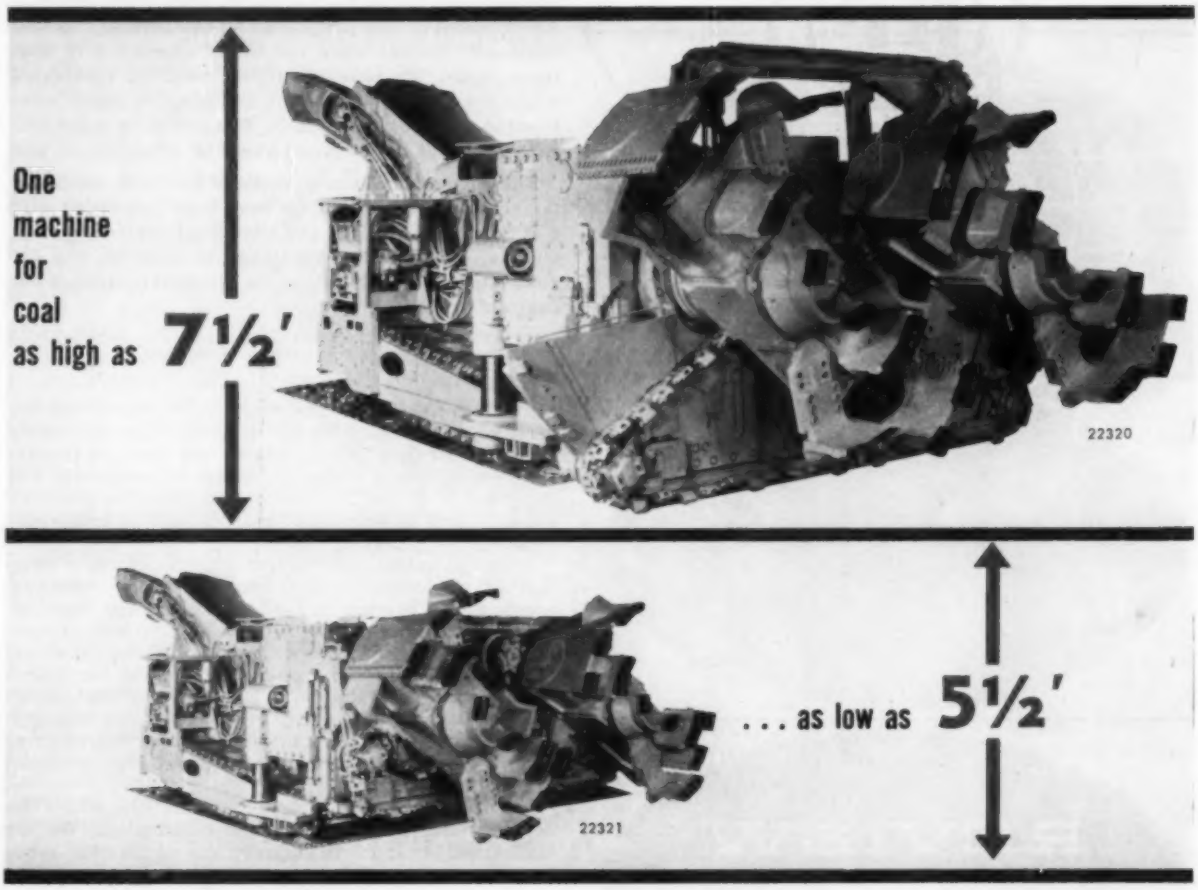
CRANES 20 ton - 100 ton • **SHOVELS** 1-yd. - 5½-yd.

NEW! "Variable Mining Height" Continuous Borer

GOODMAN TYPE 425



Here's the *newest, most versatile and powerful* continuous mining machine on the market today for profit-boosting tonnages and cost cutting performance.

Now, one machine can be utilized for full-face mining at any height from 7½' down to 5½' . . . and the mining height can be varied as the machine advances.

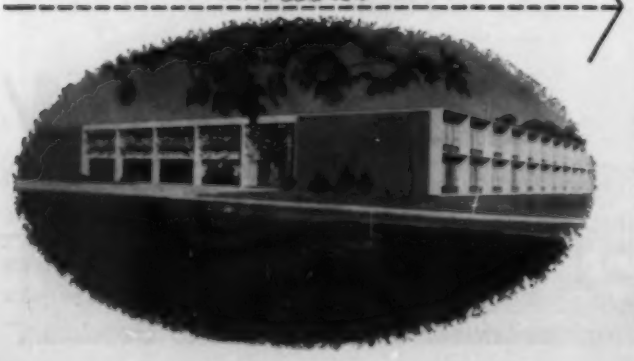
The 425 is an exceptionally rugged machine that combines capacity with a flexibility of movement that suits it to all phases of development, room, and pillar recovery work. All movements are powered by a single 250 h.p. Goodman AC or DC motor.

Call in your Goodman Sales Engineer for the full story.

GOODMAN
MANUFACTURING COMPANY
Halsted Street and 48th Place, Chicago 9, Illinois

CUTTING MACHINES • CONVEYORS • LOADERS
SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

"For continued leadership in machines for continuous mining—look to Goodman"



1958 has been a year of healthy consolidation. The generally lower level of new business we have had in common with most capital goods companies has given us a much needed opportunity to examine all our operations with the emphasis on sharpening efficiencies and stepping up the rate of our technological advance. In both, we have made substantial gains.

The sharpening of efficiencies is evidenced by a number of changes. Our manufacturing costs and delivery times are both noticeably better. A reorganization of our Research & Development group has resulted in a greater emphasis on basic research and a speeding up of development of new processes and equipment. This will ultimately include more and better manpower in both these areas. We have simplified routines, eliminated many nonessential operations and projects which seem to creep in during boom times. This allows us to proceed with less staff, but a more able and experienced one.

The current lag in new business has been much less noticeable overseas, and we have been concerned with a number of very large and significant projects abroad. Our subsidiaries have continued to progress and are contributing substantially to the financial balance of our consolidated effort.

PLANT ENGINEERING — The year's major project was the design of a 150 metric ton per day triple superphosphate plant for Mexico. This large contract includes process engineering, plant design, purchase of equipment and supervision of construction of the granular fertilizer plant as well as attendant facilities such as labs, cafeteria, offices and guest house.

A second substantial current project, which is being carried out jointly by D-O and one of our subsidiary companies in Europe, is the design of a large Yugoslavian copper concentrator. Also engineered abroad were a Belgian dicalcium phosphate plant and the expansion of a German phosphoric acid plant. During the year a large fertilizer installation in England went into operation and was rapidly brought up to operating capacity. A fertilizer plant in Montana and a copper concentrator in Israel, both D-O designed, were put into operation late in the year.

Latest addition to the list of installations which the company can now design is the board plant. We are staffed and equipped to engineer any of the basic types including wet or dry process hardboard and particle, insulating, gypsum and flake board.

PULP AND PAPER — A Canadian pulp producer will install a complete D-O Bleach Plant, and Bleach Washers will be utilized in expansion of an Indian groundwood mill. Late in the year Brownstock Washing and Recausticizing Systems, Deckers and hypochlorite preparation equipment were ordered for a new French mill. At a second French mill, a large Brownstock Washing System was put into operation in 1958.

Recausticizing Systems will be installed at two other new mills, one producing paper in India and the other linerboard in the western United States. Continued evidence of widespread acceptance of the American Disc Filter has been demonstrated by the number of orders entered for this efficient saveall. Also of interest were filters ordered for local manufacture from our Australian subsidiary and our Japanese representative.

FOOD PRODUCTS — In the citrus industry, Merco Centrifuges and Mercone Screening Centrifuges have been applied to the finish-processing of orange juice prior to concentration. Successful also has been application of

the Centrifuge-Precoat Filter combination to apple juice processing.

Corn starch washing systems consisting of various combinations of centrifugal equipment were ordered for mills in the United States, Colombia, Holland and Mexico. And, as in so many previous years, the sale of RapiDorr Clarifiers and O-C Filters for cane sugar processing has contributed heavily to orders entered.

FLUOSOLIDS SYSTEMS — Applications of the FluoSolids system were broadened in 1958 to include heat treatment or drying of such materials as foundry sand, phosphate base food products and concentrated detergent and for carbon reactivation. Another new application will be partial roasting of sulfide concentrates at one of Canada's largest smelters.

Other FluoSolids projects now in the design stage or under construction are slag dryers for India and Alabama; pyrite roasters for Spain, South Africa and California; a coal dryer for a midwestern producer and two-stage arseno pyrite roasters for installation in the gold fields of northern Canada. Now in operation or under construction around the free world are over 100 FluoSolids installations on such proven applications as sulfide ore roasting, coal and slag drying, and limestone and phosphate rock calcination.

SANITATION — This phase of our business has been particularly active during 1958 both at home and abroad. Over thirty-five installations of the CompleTreator sewage treatment unit, first introduced last year, are now in operation providing treatment facilities for housing developments, industrial plants, and other small centers of population. Equipment for large domestic projects now under construction include Clariflocculators for a chemical precipitation plant in northern New York State, Densludge Thickeners for the nation's capitol, large Digesters and Distributors for Dallas County, and Clarifiers and Distributors for a Biofiltration plant in Kansas.

Abroad, D-O will supply units for two plants in New Delhi, as well as for installations in Venezuela, Iraq and Kenya. North of the border, extensive additions to the metropolitan Toronto treatment system will be D-O equipped.

Major developments in this field have been the SR Clarifier, a new rapid sludge removal mechanism for final clarification in biological treatment, and the D-O Aerator for the activated sludge process. Installations using both units are already in operation, and a major pulp and paper producer has ordered Aerators for a new waste treatment plant.

COAL — Fine coal recovery and water clarification will be accomplished at Eastern and Australian cleaning plants in large Thickeners ordered within the past year. In a number of instances, an American Filter and ODS Pump will complete the fines recovery circuit.

IRON AND STEEL — Proof of the versatility of the DSM Screen is its application at three points in the heavy media cyclone flowsheet. In its first use on the Iron Range it has considerably reduced magnetite losses. In this general field also the Thickener-Filter combination has continued to be widely applied to recovery of blast furnace flue dust.

CHEMICAL — In 1958 new developments highlighted Dorr-Oliver activity in the far-flung chemical industry. Among the foremost of these was the plastic Filter, a rotary drum vacuum unit constructed of plastic with glass fiber reinforcing. Initial orders indicate the applicability and economy of this unit for mildly corrosive applications.

A second major development, the Merco H-30 Centrifuge, provides the chemical industry with a high capacity, high speed unit capable of clarifying up to 600 gallons of slurry per minute. The product of nearly four years of testing, this machine has substantially reduced operating power requirements per gallon of feed. One of the first commercial applications will be crystal separation at 90° below zero.

Result of yet another new design program is the expanded line of Type L centrifugal pumps. Here, three new designs provide increased capacity and head range and reverse inlet flow for operating speeds of both 1750 and 3500 rpm. In addition, Hypalon elastomer lining is now standard for both Olivite and ODS Pumps.

During the year a German manufacturer ordered the eighth and ninth Horizontal Filters for dewatering artificial resins, and domestic producers purchased Horizontals for such applications as washing ammonium sulfate and nitrocellulose and filtering potash and copperas. Also in the potash field was use of the DSM Screen for debrining crystallizer underflow.

GENERAL METALLURGICAL — Development of an air-lift agitation system for the American Filter has provided a third method of maintaining heavy solids in suspension prior to filtration. Complementing the conventional paddle and swing agitators, this new method has been extensively tested at operating installations.

U. S. and Chilean producers have ordered giant Thickeners with the strongest turntables ever fabricated, and a copper mill in the Belgian Congo will utilize ten large vacuum Filters in a current expansion. New construction at U. S. cement plants includes the three largest Slurry Mixers ever furnished, each 120 feet in diameter, as well as a variety of smaller machines.

WATER — Here also new construction and plant expansions resulted in application of a variety of D-O pretreatment equipment. Two large Hydro-Treator mechanisms will supplement four additional units already in operation at Miami, Florida; and Topeka, Kansas will utilize Presedimentation Clarifiers and Flocculators. PeriFilter systems will be installed at Peoria, Illinois and Leander, Texas; and in Mexico City the first PeriFilter of a new, simplified control design is now going into operation.

Not the least of our gains in efficiency has resulted from new and vastly improved headquarters facilities both here and abroad. Our new International Headquarters was completed here in Stamford in July, the staff of D-O NV expects to move its own new office building in Amsterdam shortly, and our associates in both Brussels and Paris are enjoying new and excellent facilities in co-operatively owned buildings.

In every respect, we are better prepared than ever before to take advantage of the upswing to come and to give better service to our customers throughout the world. This betterment, of course, could only have come about by the diligent and co-operative efforts of our total staff, and to them belongs the credit for the work done.

J. D. Hitch, Jr.
President

November 5, 1958

D-O, American, Merco, RapiDorr, FluoSolids, Densludge, DSM, Olivite, and PeriFilter—Reg. T.M. U.S. Pat. Off.
Mercone, CompleTreator and ODS are trademarks of Dorr-Oliver Hypalon—Reg. T.M. E. I. du Pont de Nemours & Co.

Symbols of Strip Mine Efficiency

These huge walking draglines are representative of modern, highly-efficient strip mining methods. They are two of nine Marion machines owned by this company and help supply a major portion of the coal used by power and industrial plants of the Indianapolis area.

CONSULT **MARION** MINING SPECIALISTS
for lowest costs on your property!

MARION POWER SHOVEL COMPANY • MARION, OHIO

A Division of Universal Marion Corporation

V-R RED BITS...and mechanized mining

the perfect team for reducing mining costs

Exclusive V-R carbides keep V-R Red Bits on the job shift after shift . . . increasing the efficiency of your mining machinery by eliminating slow downs and unscheduled down time. Top cutting performance is assured because V-R Engineers work with mining men to develop the perfect bit styles and complete size ranges for all types of cutting machines — then they engineer the carbide to do the specialized cutting job required for each type of equipment.

Send for complete catalog data or contact the V-R distributor serving your area.

The best mining bits are manufactured at V-R . . . beginning with the carbide.

V-R Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

M-720

894 Market Street • Waukegan, Illinois

RAY-MAN CONVEYOR BELT

HAULS *MORE* COAL, LASTS *LONGER*

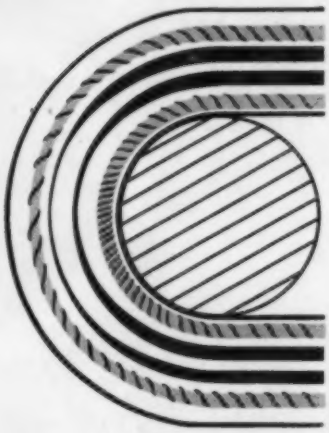
"More Use per Dollar"

Special strength members with *double* compensation to relieve stress on outer plies, give Ray-Man Conveyor Belt unusual flexibility and longer life. It trains *naturally*, troughs *easily* . . . permits fuller, heavier loads even where thick, narrow belts are used, or where pulleys are small in low-head installations. Ray-Man requires no breaker strip . . . holds fasteners under the most severe conditions, has high rip-resistance and is mildew proof. R/M's exclusive "XDC" Cover provides *real* protection against wear, tear, cuts and abrasion. Like all R/M *underground* belts for coal mining, Ray-Man is available in special fire-resistant construction with Bureau of Mines' acceptance designation: "Fire Resistant, U.S.B.M. No. 28-10."

Let an R/M representative show you how engineered features of Ray-Man and other R/M heavy duty conveyor belts add up to "More Use per Dollar" on *every* job!

For *More* Mine Drive Power in *Less* Drive Space—
Investigate patented R/M Poly-V® Drive. Write for Bulletin M141.

INDUSTRY'S ONLY COMPENSATED CONVEYOR BELT



Ray-Man Compensation relieves outer ply stress . . . allows outside ply to elongate more than inner plies as the belt flexes around the pulleys. Inner plies no longer "loaf", but carry full share of the load.

Outer ply is better able to absorb strain and impact of loading, pull its share as a strength member, protect the inner plies, greatly increase rip-resistance and fastener holding ability.

And, because Ray-Man is *double compensated*—both top and bottom plies stress-relieved—Ray-Man Compensation prolongs belt life, even where operated over reverse bend, snub or take-up pulleys!

Write for Bulletin M302.

RM 8-12

BELTS • HOSE • ROLL COVERINGS • TANK LININGS • INDUSTRIAL RUBBER SPECIALTIES

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products: Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

Get 'em there FASTER–

with KERSEY TRACTORS

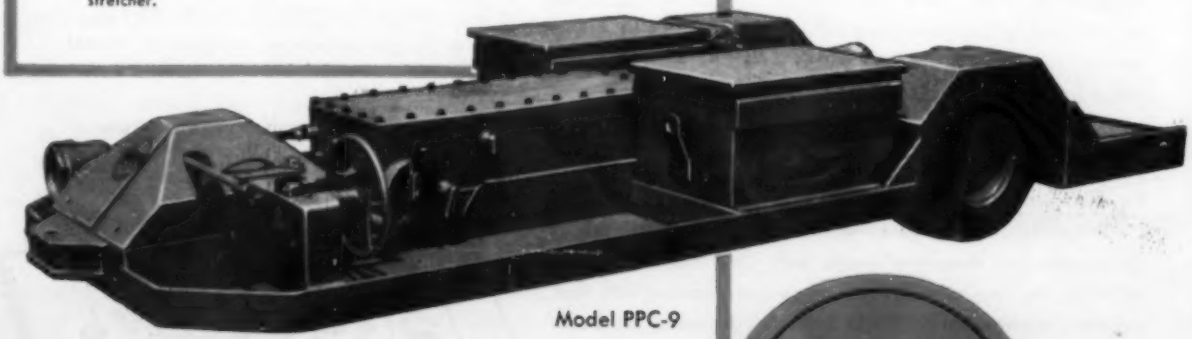
Permissible PPC-9 & 10 Personnel,
Supply and Service Tractors Provide
Maximum Safety . . . Maximum Time-Saving

- Speed up work of mechanics, electricians, repairmen as well as officials. (PPC-9 seats six; PPC-10 seats eight).
- Quickly remove injured. Rear cargo decks will accommodate stretcher.
- Easily transport tools and supplies. Detachable rear cargo compartments have capacity of 2,000 lbs.
- Also double as tractors for towing supplies and man trip cars.

KERSEY
Model PPC-9 & 10

(U. S. Bureau of Mines Approved Certificate No. 21285)

AXLE ASSEMBLY	Heavy-duty 4,000 lbs. Rated differential assembly with power-lock. Power-lock unit maintains traction on both rear tires even though one tire may be on a slippery surface.
BATTERY	12.8 K. W. H. Battery, in two steel trays with covers. Each battery tray equipped with Kersey Fused Receptacle Enclosure. (Approved by U. S. Bureau of Mines).
BELL	6" Trip Gong. Serves as warning device to meet mine safety laws.
BRAKES	Hydraulic — Airplane Disc Type.
CONTACTOR	Magnetic Type, in permissible enclosure. Two speeds — forward and reverse.
DRAW BAR PULL	For starting: 7,300 lbs.
LIGHTS	Permissible — Front & Rear.
LIGHT SWITCH	Mounted within permissible enclosure. Operates front and rear lights. Both lights do not burn at same time.
MOTOR	6-½ H. P. Series Wound, Heavy-Duty Gearmotor in permissible enclosure.
MASTER OPERATING SWITCH	Mounted within permissible enclosure.
RESET SWITCH	This is a safety switch which must be closed before master switch will operate.
REDUCER	Kersey, Model 57. Designed to withstand 300% overloads. Ball bearings are used throughout reducer. No critical adjustments. Optional speed ratios.
WIDTH	PPC-9 width is 62". PPC-10 width is 74" giving more room for personnel and equipment.
SPEED	Standard Fast Speed: 350 R. P. M. Slow Speed: 230 R. P. M. Two speed each direction: 3 & 6 M. P. H.
TIRES	Rear — 6.50 x 10, 6 Ply Industrial Type — Rib Cleat Tread. Front — 5.50 x 8, 8 Ply Industrial Type — Rib Cleat Tread.

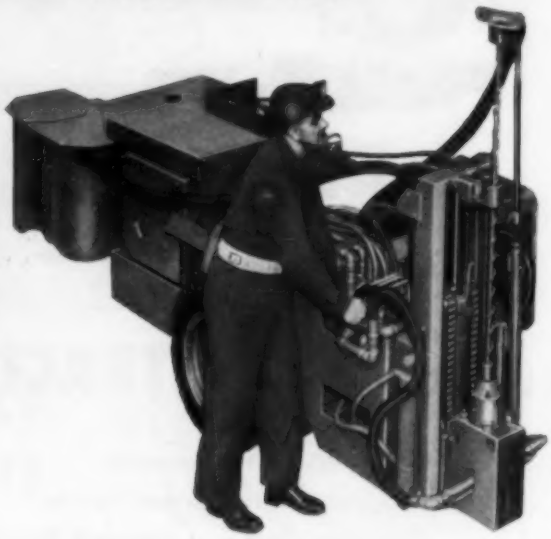


Model PPC-9

If you are starting a new mine or modernizing your present mine--check with us, first. We would like to work with you in laying out your plans to include the most efficient and flexible system for moving supplies and personnel.

KERSEY MANUFACTURING CO. INC. BLUEFIELD, VIRGINIA

Fletcher EXTENDED-HEAD Roof Drills Bring NEW ACCESSIBILITY OF CONTROLS ...INCREASED OPERATOR EFFICIENCY... For Faster, Safer, Bolt Installation!



FLETCHER Roof Control Drills now provide the advantage of extended head design on all standard models. Operators stand away from the face and away from the rib, *regardless of where bolt is to be installed*. Control handles on both sides of head work in the same direction for easier, surer operation.

Your drillers will find that they can do their job faster with this new control system. *And maintenance men will like the new accessibility of the "packaged controls"*. All valves are bolted to a drop-in plate, permitting them to be removed as an assembly. Fewer hoses need be disconnected to reach the point requiring service . . . and less service is required . . . because of their protected location within the body of the head extension.

Coupled with the advantages of long, fast, telescoping stroke . . . high thrust . . . and all-hydraulic positioning, *FLETCHER Drills give you two-man results with ONE-man operation.* NOW is the time to cut your roof control expense with fast, efficient, economical FLETCHER Drills. Let us talk to you about the new standard designs . . . or *specials to meet your specific requirements.*

FEATURES

- Jack-feed system delivers maximum smooth thrust with quick raise and return.
- Hydraulic lowering device lets you drill directly from the mine floor.
- Hydro-slide moves your drill across the place smoothly, accurately and fast.
- Compact frame and third-wheel steer makes tramming quick and easy.
- Height range from 28-inches to 14-feet lets you select a drill to exactly fit your mine.
- Telescoping mast gives full stroke in varying seam conditions. And the new floor-to-roof mast gives added safety, speed and power.

Fletcher
ROOF CONTROL DRILLS

J. H. FLETCHER & CO. | P. O. Box 2143, HUNTINGTON 18, WEST VIRGINIA
JAckson 5-7811

The simple, low cost answer to these coal preparation plant problems...

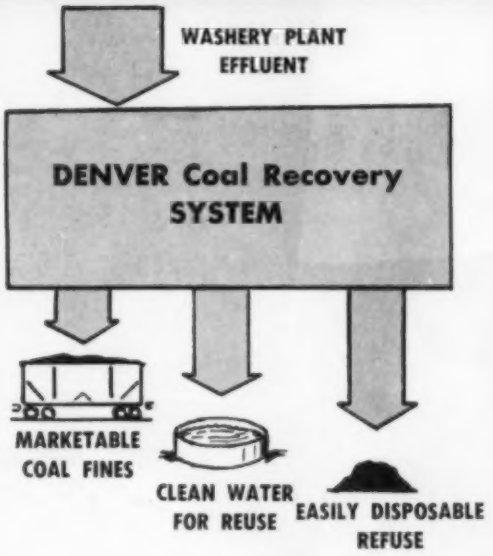
1. **Recovery of marketable coal fines from washing plant waste**
2. **Removal of solids from washery plant effluent**
3. **Reclamation of water in closed water systems**

DENVER Coal Recovery SYSTEMS

SIMPLE • EFFICIENT • PROFITABLE

Since more fines are produced in mechanized mining, it is not economical to discard coal fines to waste even though ash contaminants may render these fines unmarketable without additional cleaning. Washeries faced with recovery of clean coal fines, removal of solids from plant water and providing a closed plant water system, now have a simple, low cost answer.

Whether you are confronted with any or all of these problems, DENVER can provide the answer with a simple, low cost system that will recover both coarse and fine, marketable, low ash coal from minus ⅛" down to 200 mesh and finer. A compact system that will reclaim water for reuse in a closed system—one that permits disposal of high ash washery waste without stream contamination—efficiently and profitably.



DENVER ***offers one source for*** **COMPLETE SYSTEMS, INDIVIDUAL COMPONENTS**

- **DENVER offers over 30 years of experience in designing and supplying coal washery plant systems. A complete service from testing to flow-sheet to equipment, installation and to profits. One source—one responsibility.**

"The firm that makes its friends happier, healthier and wealthier"

DECO ENGINEERED STANDARD RELIABLE 24 HOUR SERVICE EFFICIENT

DENVER EQUIPMENT COMPANY

Cable DECO DENVER

Phone CHerry 4-4466

1400 Seventeenth St. Denver 17, Colorado

DENVER EQUIPMENT CO.
1400 17th St.
Denver 17, Colorado

Please send details of your complete system and service for handling coal washery effluent.

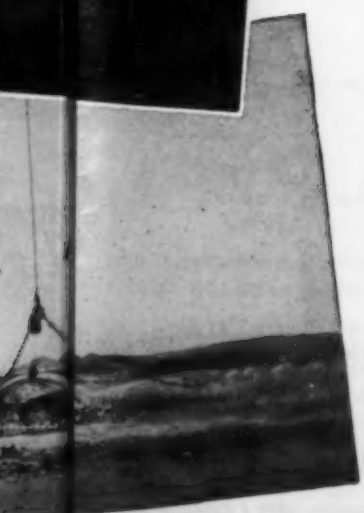
Name_____

Title_____

Company_____

Address_____

City_____ State_____



AC and DC

Westinghouse motors are job-proved for all mining applications

Regardless of whether you need a-c or d-c motors . . . regardless of the particular application . . . you'll find there's a Westinghouse motor to do the job . . . a motor which has proved itself time and again for rugged dependability and long operating life.

Combining the most modern materials with proven dependability and durability, Westinghouse motors will help you increase production through more efficient service . . . will help you decrease capital investment by giving you many extra years of reliable performance.

Westinghouse motors . . . either a-c or d-c . . . are available in all ratings, mountings, enclosures . . . standard or special design. Prompt delivery is backed by expert application and service-engineering assistance.

For complete information, contact your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J-22120

YOU CAN BE SURE...IF IT'S Westinghouse

More tonnage . . . more profits

50% Higher Tonnage with the *new* CM37

For medium and high seams

Backed by the tried and proven cutting principle of the original Lee-Norse Miners, the CM37 brings a new high in operational efficiency to continuous mining. This rugged machine has more power, more capacity and higher tramming speed that results in increased tonnage per man shift.

Check these NEW FEATURES!

- Total weight 25 tons—a 25% increase! Extra weight mostly in improved cutter head where it does the most good!
- More power—fewer motors! Only 3 identical electric motors used . . . conservative continuous ratings . . . no water cooling.
- Heavy duty electric control.
- 14" wide crawler treads with improved hydraulic motor and gearing.
- 24" wide conveyor driven by hydraulic gear motors applied directly to gathering head. Hydraulic start and stop . . . no clutch required.
- Multiple tramming speeds—variable speeds to 50 feet per minute . . . fast tramming at 90-100 feet per minute.
- Increased capacity...4 to 5 TONS PER MINUTE.

Coal high or low? . . .

. . . with Lee-Norse MINERS

For Low Coal . . .

LCM28

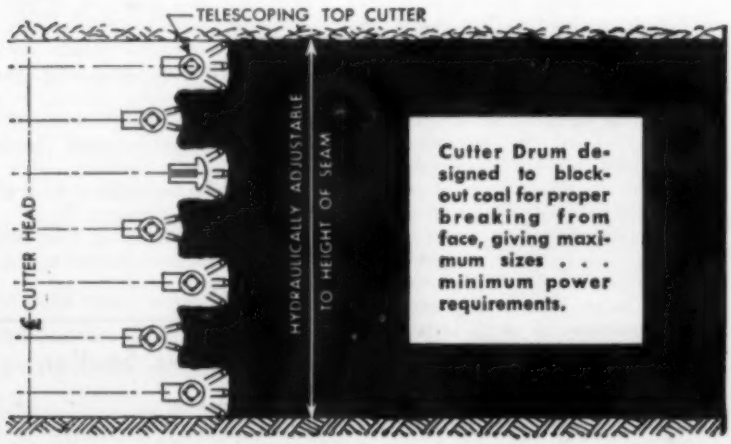
ready for production!

For seams 30" to 48"

Here's how LCM28 *produces profitable tonnage!*

1. Weight 16 tons—rugged and heavy enough to cope with tough cutting conditions.
2. Capacity—2 to 3 tons per minute.
3. Hydraulically driven 24" flexible Conveyor.
4. Two Cutter Heads cut a wide face 16 feet or less.
5. Dual gathering arms have maximum reach of 11 feet . . . will gather ALL the coal regardless of position.
6. Controlled Tramming Speed gives proper sumping action and Dual Pump combination gives high tramming speed.
7. Especially good in cross-cut development!

The LCM28 "Low Coal" Miner employs a new combination of cutting and gathering coal. The vertical mounted extendable cutter drums arc together like a "clam shell."


TELESCOPING TOP CUTTER
CUTTER HEAD
HYDRAULICALLY ADJUSTABLE TO HEIGHT OF SEAM
Cutter Drum designed to block-out coal for proper breaking from face, giving maximum sizes . . . minimum power requirements.

All Lee-Norse Miners are available in AC or DC power.

Lee-Norse Company
CHARLEROI, PENNA.
Specialists in Coal Mining Equipment

Lee-Norse MINERS keep production on the go!

News Roundup

Miners Get Pay Hike

Coal operators agree to increased wages and vacation pay, from Jan. 1; vow not to handle non-union coal.

United Mine Workers members will get a $1.20 per day raise starting Jan. 1, with another 80c per day forthcoming next April 1. Besides this, vacation pay was upped to $200 rather than the previous $180.

The Future—The new contract between the miners and the Bituminous Coal Operators' Association, which continues the labor peace in the coal fields begun in 1950, will last indefinitely beyond its Nov. 30 deadline unless either party serves 60-day termination notice.

Eyebrows Up—Many industry sources are reportedly bemused that John L. Lewis, heretofore adamant against any handling of non-union mined coal by operators, accepted a double standard on such coal by agreeing to separate contracts with commercial mine owners and captive mines owned by steel companies. Under contract terms, commercial operators would be barred from buying, handling or selling non-union coal while the proposed contract for captive mines has no such ban. The main provisions of this Protective Wage Clause are as follows:

"The United Mine Workers of America (which, as used in this clause, includes all of its districts, local unions, officers or agents) and the operators signatory hereto affirm their intention to maintain the integrity of this contract in all of its parts. The objective of this contract is to provide the maximum possible continuity and stability of employment under the conditions set forth herein. The parties hereto agree that bituminous coal mines shall be so operated as not to debase or lower the standards of wages, hours, safety requirements and other conditions of work, established by this contract. The parties recognizing their obligation each as to the other to exercise all possible efforts and means to attain these objectives further agree as follows:

"A. During the period of this contract, the United Mine Workers of America will not enter into, be a party to, nor will it permit any agreement or understanding covering any wages, hours or other conditions of work applicable to employees covered by this contract on any basis other than those specified in this contract or any applicable district contract. The United Mine Workers of America will diligently perform and enforce without discrimination or favor the conditions of this paragraph and all other terms and conditions of this contract and will use and exercise its continuing best efforts to obtain full compliance therewith by each and all the parties signatory thereto.

"B. It is recognized that when signatory operators mine, prepare, or procure or acquire under subcontract arrangements, bituminous coal mined under terms and conditions less favorable than those provided for in this contract, they deprive employees of employment opportunities, employment conditions and other benefits which these employees are entitled to have safeguarded, stabilized and protected. Accordingly, the operators agree that all bituminous coal mined, produced, or prepared by them, or any of them, or procured or acquired by them or any of them under a subcontract arrangement, shall be or shall have been mined or produced under terms and conditions which are as favorable to the employees as those provided for in this Contract.

"Procured or acquired under a subcontract arrangement' means any contract, lease, license, agreement, arrangement or understanding pursuant to which the signatory operator acquires coal, either as principal or agent, directly or indirectly from a producer other than such signatory for delivery to a person other than such signatory."

Contract Committee—A Joint Industry Contract Committee limited to handling problems arising under the Protective Wage Clause is provided for in the agreement. This committee will have six members, three from the union and three from the Operators' Association. It will hear any complaint or allegation by a party signatory to the contract and a majority decision will be necessary to affirm a violation of the Clause.

The committee may appoint Joint District Contract Committees in various districts, consisting of half union members and half operators, also. Coal operators in these districts must register with the committees and the union district president will certify a complete list of operators and mines engaged in bituminous production within his district. This will provide the committees with the information needed or a closer check upon complaints.

Sidenote—Joseph E. Moody, president of Southern Coal Producers' Association, signed the agreement on Dec. 4. However, he notified Mr. Lewis that the board of directors of SCPA had authorized him to "execute the amendment for and on behalf of such of its members as may thereafter authorize him in writing so to do," thus leaving SCPA members the option of becoming signatory to the contract.

Lewis Comment—Commenting on the importance of the new contract, John L. Lewis said:

"The wage and work standards, job opportunities and other benefits to which our members are now contractually entitled have been achieved only after long and arduous years of experience in the coal fields. The present and future welfare of the men who daily risk their lives in this most hazardous of industries demand that these standards, opportunities, rights and benefits be maintained, protected and safeguarded by contract. This the union seeks to accomplish by the terms of the protective wage clause, which is to be administered by a Joint Industry Contract Committee of Six, divided equally between the parties and to be selected within the next 30 days.

"Because of their indulgence in and frequent fostering of such evil practices, and perhaps because of some small attendant costs which may be involved in their elimination, the coal operators have been loathe to admit these practices and to consent to their correction by contract. Reluctantly they today make their confessions and agree to 'Go and sin no more.'

"We are confident that the terms of

In This Section

People in Coal ..... p 30
Coal Abroad ..... p 38
Current Coal Patents ..... p 44
Mines and Companies ..... p 54
Transportation ..... p 54
Preparation Facilities ..... p 56
Coming Meetings ..... p 56
New Books ..... p 56
Equipment Approvals ..... p 60

Here's a complete handbook on Wire Rope!

Here — in a compact book — is the information you can use to reduce your yearly rope costs. It's free to wire rope users . . . just ask for G16: Macwhyte's "Blue Book of Wire Rope."

This completely indexed, pocket-sized book lists rope sizes, strengths, weights, lays, sheave sizes, and materials, plus inspection and lubrication procedures.

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Manufacturers of Internally Lubricated PREformed Wire Rope; Braided Wire Rope Slings; Aircraft Cables and Assemblies; Monel Metal, Stainless Steel, Plastic-Coated and Nylon-Coated Wire Rope; and Wire Rope Assemblies. Special catalogs available.

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129

MACWHYTE WIRE ROPE

Wire Rope made for a purpose—to serve you better

this contract are reasonable ones, calculated to maintain the living standards of our members and to bring continuity and stability of employment. Certainly these things are much to be desired and are definitely in the public interest. Accordingly, we believe that time will serve to assuage the presently ruffled spirits of the operators and that they will soon come to realize and publicly admit that this contractual recognition of their employees' needs and their reasonable demands, gaged by all modern standards, is fully justified and morally right. Since the signatory captive mine operators consume their own entire output of coal and are not engaged in the commercial field, the protective wage clause is not included in the contract as executed by them."

The Answer—Edward G. Fox, president of the Bituminous Coal Operators' Association, in reply to Mr. Lewis' statement, commented:

"The Association agreed to this Protective Wage Clause for commercial operators under extreme union pressure and only to avoid an interruption of the supply of the world's most dependable fuel to coal customers. Over the past eight years, these consumers have come to expect this continuous supply without the necessity for uneconomic stock-piling or resort to other fuels."

He added that the agreements insure the era of labor peace in the coal fields since 1950 will continue.

Gas Wins Close One

After long deliberation, the lower court decision in the Memphis Gas Case which said rate increases become effective only with customer consent, has been reversed by the Supreme Court. The high court reasoned that gas companies must be able to increase their prices whenever it is necessary to keep revenues and expenses in proper balance.

Dissenting in a 5 to 3 decision were Justices Warren, Douglas and Black who held the majority ruling to make a shambles of the Natural Gas Act so far as consumers are concerned. They argued that consumer interests, supposedly protected by the Act, were being sacrificed in the cause of those who exploit gas.

Erases Refunds—The Federal Power Commission reports that 34 pipelines had raised their rates without customer consent at the end of 1957, therefore had the lower court decision stood it would have seriously upset the gas industry by requiring more than $225 million in refunds. Some companies would have been forced to reorganize and others would have gone bankrupt, the Commission said.

New Expansion—The decision is seen as preventing serious impairment of the pipeline company's ability to secure financing for expansion. During the year following the lower court ruling it is known that at least four pipelines dropped plans for $220 million of construction pending Supreme Court review of the issue.

Coal's View—The coal industry, which has viewed the Memphis Case with interest from the sidelines, welcomes the decision by the Supreme Court. It will enable pipeline companies to be freer with price hikes in the future perhaps resulting in less competition for coal's markets.

Plan Nuclear Plant

Philadelphia Electric Co., and High Temperature Development Association, Inc., which comprises 44 private utilities, have handed the AEC a joint proposal for a $24,500,000 nuclear plant to produce electric power at competitive costs.

The proposal is partly intended to head off public development of nuclear power, Congress having ordered AEC to build a similar gas-cooled plant at public expense if private industry would not do so.

To be completed in 1963, the helium-cooled plant's capacity will be 30,000 to 40,000 kw, according to reports, or less than 2% of Philadelphia Electric's present and planned production.

COAL AGE

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 COLLIERY ENGINEER, with which MINES AND MINERALS previously had been consolidated, was absorbed by COAL AGE.

In 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., Inc. COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During 47 years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Lesher, John M. Carmody, Sydney A. Hale and Ivan A. Given. The editorial staff of COAL AGE presently consists of Ivan A. Given, Harold Davis, A. E. Flowers, W. A. Raleigh Jr., Daniel Jackson Jr. and R. J. Taft.

Under terms of the plan submitted, the government must put up $14,500,000 for further research and development by General Atomic Div. of General Dynamics Corp.

Certificates Voided

The Illinois Mining Board has revoked indefinitely the competency certificates of three supervisory employees of Old Ben No. 9 mine near West Frankfurt, Ill.

The action stemmed from charges by a state mine inspector that men were permitted to enter the mine when a known dangerous quantity of gas existed. The men losing their certificates were John Sharknas, mine manager; Cecil Luther, face boss; and McKinley Glen, face boss. Similar charges of negligence against two other supervisors at Old Ben mine were dismissed.

BCI Holds Markets

Bituminous Coal Institute reports that it gained or retained 614 plants as coal customers in the 12 mo ending Sept. 30—plants burning 7,092,460 tons per year.

In the same period, 535 plants consuming 2,770,410 tons annually were lost despite BCI's efforts. Except for loss of several large accounts because of low oil pricing in multifueled plants, it is reported, BCI won 10 times as much tonnage as it lost.

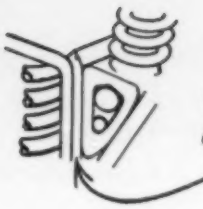
In the way of further markets for coal, a BCI spokesman speaks encouragingly about a packaged coal-gas producer made in England and being evaluated for application to Midwest and western coals. BCI notes also that a 1958 fuel cost study showed gas costs are higher in all but 12% of the 234 cities where it competes with coal. Oil prices are lower than off-track coal in only 31% of 175 cities where oil and coal are competitive, the study shows.

Production Forecast

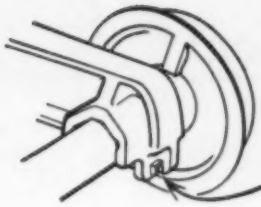
The National Coal Association's Committee on Coal Economics says that 1959 will see production of 459 million tons of bituminous coal, an increase of about 13.8% over 1958. Coal consumption will increase 8.1% to equal production, the committee estimates, in contrast to this year when many customers reduced stockpiles and used more coal than was mined.

More facts compiled by the Committee show that 163 million tons should be

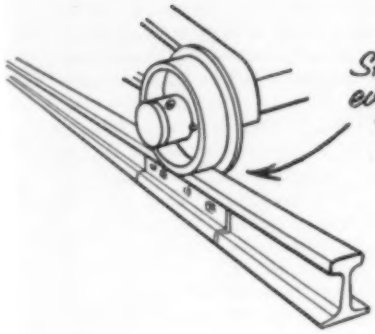
(*Continued on p 50*)



Movement between bolster and side frame is taken on specially designed wear surfaces

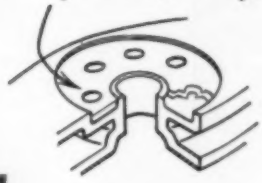


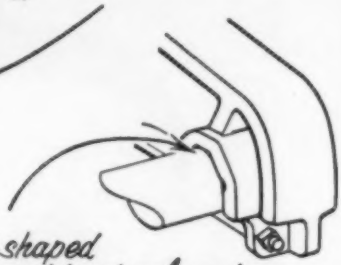
Quick wheel change



Smoother ride even on rough tracks

Large center bearing for longer life



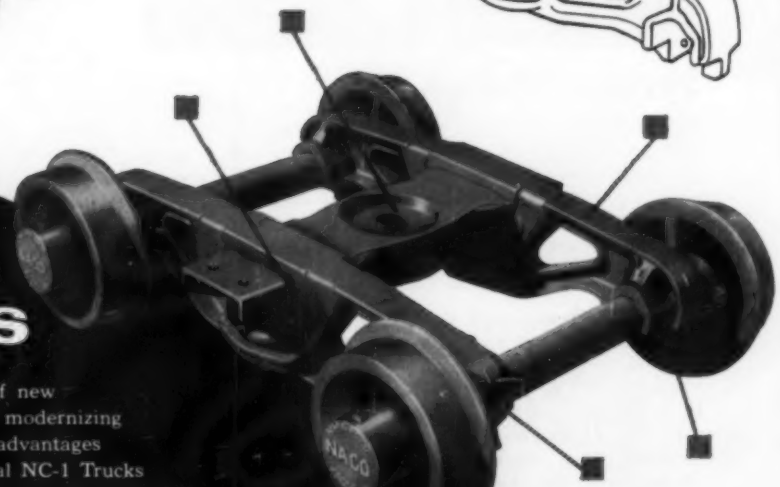


V-shaped machined axle grips for controlled flexibility and truck alignment

Integral cast frame has no welds or rivers

Check these "plus" features

OF NATIONAL NC-1 TRUCKS



If you're considering the purchase of new 8-wheel mine cars . . . or if you're thinking of modernizing older cars—*now* is the time to check the advantages of National NC-1 Trucks. National NC-1 Trucks have controlled flexibility for track variations yet still maintain truck alignment through their machined V-shaped axle grips. In addition, NC-1 Trucks have a built-in shock absorbing mechanism.

You get more out of your mine car investment per workshift . . . per day . . . per year. And at the same time you minimize spillage . . . get greater protection for your equipment, track and structures . . . slash maintenance to a new low.

Yes, *now* is the time to check National NC-1 Trucks—they make sense for 8-wheel mine cars . . . *make dollars for operators*, too.

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- RUBBER CUSHIONED UNITS
- NC-1 CAR TRUCKS • NACO STEEL WHEELS
- NACO STEEL LINKS & SWIVEL HITCHINGS

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People in Coal

Service Stepup

RAYMOND E. SALVATI, chosen December as the new president of the American Mining Congress, has had a career filled with experience and responsibility, ranging from a polio-ridden childhood and newspaper sales on the streets of Monongah, W. Va., to the presidency of Island Creek Coal Co., third largest coal producer in the United States. In rising to the leadership of the Mining Congress, Mr. Salvati succeeds Howard I. Young, who served as the organization's president for 25 yr.

Despite childhood hardships, Mr. Salvati was determined on a mining career and to that end enrolled in the School of Mines, West Virginia University. Graduating in 1922, he joined the Island Creek organization as a trackman at Mine No. 16 in Mud Fork, Logan County, W. Va. With the duties of bondman and timberman added to his chores, he worked his way up to assistant mine foreman in only eight months and ten months later was made superintendent of Mines 15, 16, 17, 18 and 19 on Mud Fork.

After being transferred to Pond Creek Pocahontas Co. in 1926 as superintendent of Mine No. 1, he became manager of the company in 1928 and vice president and director in 1932. Transferred again to Island Creek Coal Co. as acting general manager in June, 1935, Mr. Salvati retained his status with Pond Creek Pocahontas Co. Promotions in Island Creek were also rapid: In 1936 he became general manager; in 1940 a vice president and in 1942 a director. In 1949 he took over the presidency of Island Creek and has led the firm successfully since then, buying new lands and initiating a foreign market.

Many jobs cry for this native West Virginian's time. He is a director of the National Association of Manufacturers, the National Coal Association, the West Virginia Coal Association and held a similar position in the Bituminous Coal Research organization. Before his election he was vice president of the Mining Congress as well as a director, and chairman of its Executive Committee. He is a member and past president of the Board of Governors of West Virginia University, was draft board chairman for Logan County and has participated actively in charitable activities as a director of St. Mary's Hospital and the West Virginia Cancer Society.

For relaxation Mr. Salvati finds enjoyment in sports, fishing the abundant lakes and streams in his native state. His election to the presidency follows closely on the heels of his receiving the Horatio Alger Award for outstanding achievement in industry.

Finley H. Davis, president of Midland Mining Co., has been reelected president of Hazard Coal Operators Association. Reelected to the vice-presidency was **L. A. Hopper,** owner of Greenridge Coal Co. and to executive secretary and treasurer, **Fred B. Bullard.** Members elected to the Board of Directors were: **Bruce Davis,** general manager, Old King Mining Co.; **C. E. Fannin,** general manager, Carrs Fork Coal Co.; **R. H. Kelly,** president, Fourseam Coal Corp.; **Harry LaViers,** president, South-East Coal Co.; **John Mayhew,** vice president, Blue Diamond Coal Co.; **F. M. Medaris,** president, Harvey Coal Co.; and **C. E. Walker,** vice president, Jewell Ridge Coal Corp.

During the 50th annual meeting of the Alabama Mining Institute in Birmingham, Ala., eight mining officials were elected to the Institute's board of governors Named were **H. F. DeBardeleben,** DeBardeleben Coal Corp.; **M. H. Fies,** Alabama Power Co.; **R. E. Garrett,** U. S. Pipe & Foundry Co.; **A. R. Long Sr.,** Brookside-Pratt Mining Co.; **David Roberts III,** Brilliant Coal Co.; **J. E. Urquhart,** Woodward Iron Co.; **P. H. Neal,** Alabama By-Products Corp., and **Ben H. McCrackin.**

Dr. H. J. Rose, vice president and consultant for Bituminous Coal Research, Inc., has been named for the 1958 Worcester Reed Warner Medal for outstanding contribution to engineering literature. The medal was awarded to Dr. Rose at the annual meeting of the American Society of Mechanical Engineers in New York City in recognition of his "valuable work done in investigating and reporting the characteristics of coals, the beneficiation of coal by various processes, and the use and control of combustion by-products." Prior to joining BCR in 1944 as vice president and director of research, Dr. Rose was vice president in charge of research of Anthracite Industries, Inc.

C. R. Griffith, Southern Coal & Coke Co., has been reelected president of the Southern Appalachian Coal Operators' Association. **Fred Loving Jr.,** New Jellico Coal Co., was named first vice president and **P. B. C. Smith,** Pocahontas Fuel Co., second vice president. **H. S. Homan** was reelected executive secretary and treasurer. Directors elected were: **Lindsay Young,** Garland Coal Co.; **R. H. Hughes,** Clinchfield Coal Co.; **Ray S. Walker,** Laddie Coal & Mining Co.;

No. 11 in a series

Right off the Wire

Before the first nuclear-powered merchant vessel is launched, a new reactor system which has been designed is expected to reduce the cost of a comparable installation by forty per cent.

After leaving a new electric shaver plugged into an outlet overnight it can be used for a week without recharging.

A radio operator's vest, with pockets for dry cells, can be worn under outer garments in arctic cold. The batteries, when kept warm by body heat, are said to last ten times longer.

Automobile batteries are now made with cells which can be removed and replaced in a few minutes.

A new electronic surveying technique, now in use in highway layout work, enables engineers to establish numerous ground control points and measure distances in a matter of minutes. Maximum possible error is only 11 inches in 40 miles.

Copper strip is being made from powdered metal. The process can also be used for other metals which can be combined in no other way.

A portable building for use in the arctic has hollow walls of nylon fabric. When the walls are inflated the building stands erect.

A research program has begun for the study of new semiconductors for use in transistors. The materials are indium phosphate, gallium arsenide, aluminum antimonide.

An insulated guard rail for the end of the boom is made to protect a crane operator in case of contact with a power line.

More and better rayon is the object of a study of cellulose growth in living trees. Two-year-old pines are injected with radioactive carbon and are later cut down for examination.

A new plastic adhesive used in aircraft construction is semi-elastic and stronger than the metals it joins.

A new titanium alloy is made into sheets that will withstand air pressures of over 100 tons per square inch.

The "world's loudest noise" can be produced by a new compressed air loud speaker that is capable of projecting the human voice for ten miles.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

Twelve pneumatic tires, each supporting a load of 20,000 pounds, enable a new lift to pick up and move concrete pipe sections at five miles per hour.

The Post Office Department has awarded a contract for the development of a mechanical letter-sorting machine.

Aerodynamic shapes designed to travel at over 8,000 miles per hour can be tested in a new wind tunnel.

Layers of steel, bronze and a mixture of lead and plastic compose a new dry bearing material that requires no lubrication.

Coils of aluminum, plastic or steel, up to 82″ O.D., can now be spiral wrapped by machine.

A new method of producing electricity uses a fuel cell that converts hydrogen and oxygen into direct current by means of a catalyst.

A new recording instrument measures heat absorption in any area and is used for allocating air conditioning or heating charges to tenants.

Quartz tubing is being made so small that fifty feet contain only one drop of water.

A new heat resistant paper is made of ceramic fibers.

Simplex Goes To Sea

The 36,000-foot "sea section" of the Simplex submarine communication cable, for use between Cape Neddick, Maine, and Boone Island Light, was loaded in August at Boston.

The cable came off a giant reel (dia. of head 126 inches) and was carried over a capstan to the 126-foot barge.

The cable is described as "4-conductor, No. 9 AWG stranded, ANHYDREX insulated, armored submarine communication cable."

The reel and its load of more than six miles of cable weighed 68 tons.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

People in Coal *(Continued)*

Warren Haydon, Wind Rock Coal & Coke Co.; **E. F. Wright,** Clinchfield Coal Co.; **C. J. Potter,** Rochester & Pittsburgh Coal Co.; **D. R. Christian,** Beech Grove Mining Co., and **W. T. Ray,** Meadow Creek Coal Co.

William W. Dukes and **Thomas H. Woodard** have been elected vice president-operations and vice president-financial, respectively, to serve both Sherwood-Templeton Coal Co. and Stonefort Corp. The announcement was made by S. F. Sherwood, president of the Indianapolis-based firms. Mr. Dukes was superintendent of Stonefort's Will Scarlet mine and Mr. Woodard was treasurer of Sherwood-Templeton and secretary-treasurer of Stonefort. The elections followed the resignation of Reed Moyer, who served as vice president of both organizations.

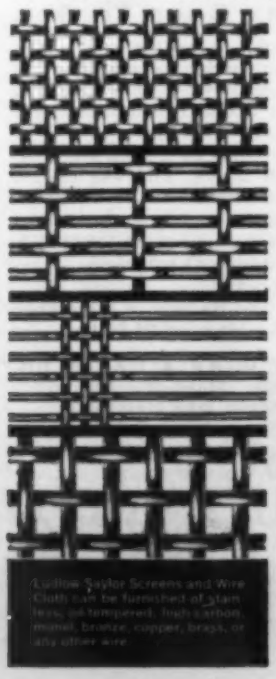
George R. Higinbotham, Jamison Coal & Coke Co., **Stephen Canonico,** Clinchfield Coal Co., and **W. J. B. Mayo** were elected vice presidents recently of the Northern West Virginia Coal Association

Elected as secretary treasurer was **T. E. Johnson,** U. S. Steel Corp.

William G. Kegel, formerly assistant general master mechanic for the Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp., has been promoted to general master mechanic. Mr. Kegel started his career in mine equipment maintenance with Lee Norse Co. in 1940 and held positions there as electrician, service man and foreman of the mechanical and electrical departments. He joined J&L in 1950.

Arnold B. Rush, chief electrician for Powhatan Mining Co., strip operations, has been appointed chief electrician for Conemaugh Mining Co., both of North American Coal Co. Mr. Rush succeeds **Harry S. Hencel** who retired on December 31 after 37 years of service to North American.

LUDLOW-SAYLOR shears—does not burn—wire ends to insure accurate dimensions and to prevent distortion



Burning off uneven wire ends, after screens are woven, is common industry practice . . . but not Ludlow-Saylor! L-S Screens are trued up on a leveling machine, then are sharply sheared on all sides to insure absolute accuracy and to prevent any distortion of the precision-woven openings.

This extra 2-man operation is typical of the many reasons why L-S Screens wear longer—stand up better under toughest conditions—and retain their rigid dimensional stability far longer than ordinary screens. *Order L-S Screens next time . . . you pay no more, but get much more!*

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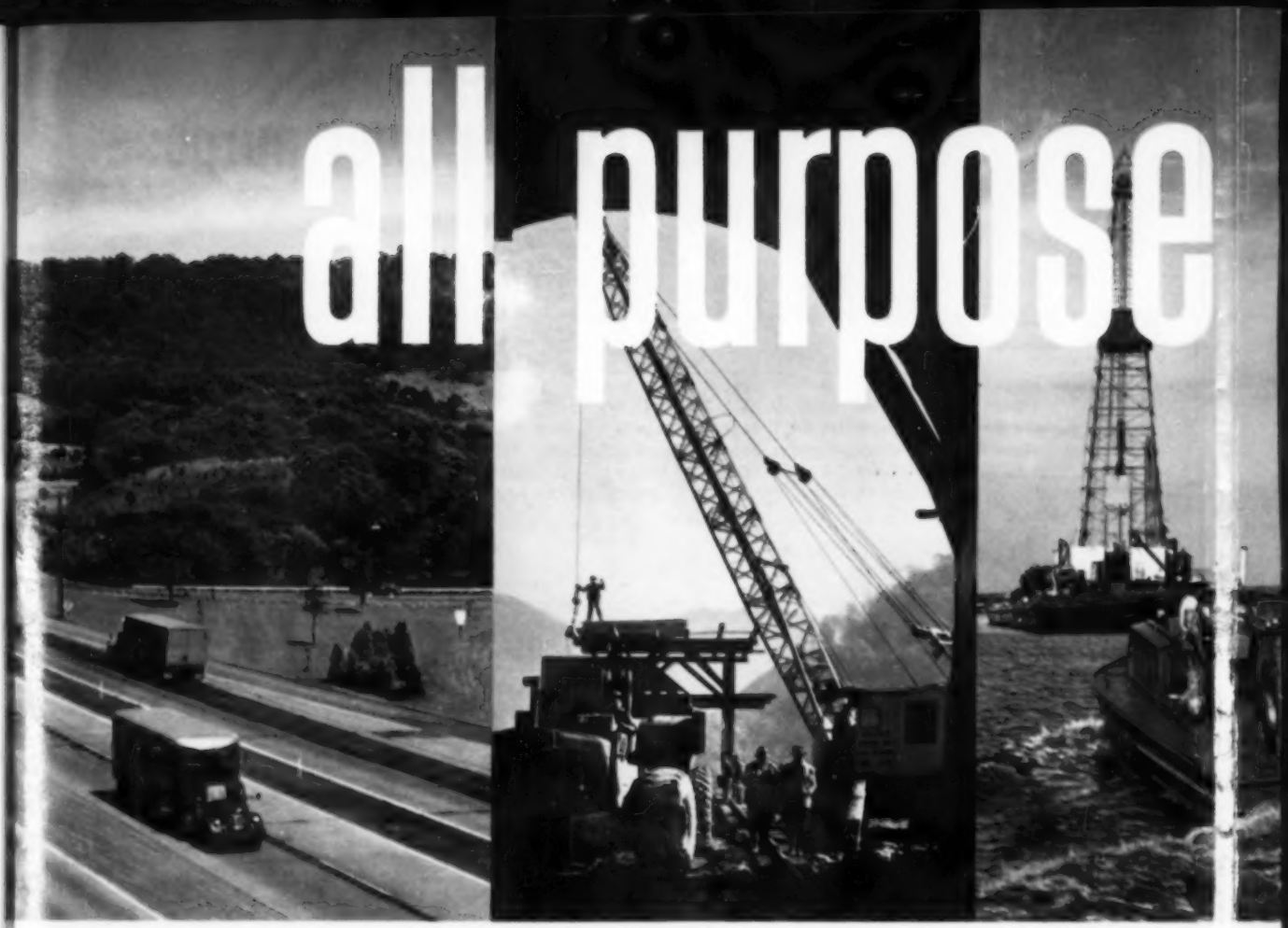
SALES OFFICES: Birmingham, 1727-6th Ave. N.; Chicago, 5708 W. Diversey; Pittsburgh, Union Trust Bldg.; Houston, 1213 Capitol Ave.; Denver, 1530 Carr St. WEST COAST SUBSIDIARY: Los Angeles, Star Wire Screen and Iron Works, Inc., 2515 San Fernando Road.

Obituaries

Hooper Love, 70, president of West Kentucky Coal Co. until 1956 when he retired, passed away recently. Mr. Love, who became president of West Kentucky in 1940, started in the coal business in 1906 with the St. Bernard Coal Co. It later merged with West Kentucky in 1924 and Mr. Love rose through the ranks to its helm.

E. H. Fuertinger, executive vice president and treasurer of Maust Coal and Coke Corp. of New York, died recently of a heart attack. As an expert in the field of taxation, Mr. Fuertinger served on the National Coal Association's Committee on Coal Economics and Statistics.

Santo Volpe, 79, passed away recently following a long illness. At his death he was owner of the Gateway Coal Co., Forest City, Pa. and vice president of Newport Excavating Co., Nanticoke, Pa. He made his home in the town of Pittston, Pa.



GM Diesel combines 8 New Basic "V" and "in-line" engines with its

To help industry fill its power needs, GM Diesel engineers have developed the most comprehensive power concept since they pioneered the small 2-cycle Diesel.

Using only 3 cylinder sizes, they have more than doubled the number of basic engines – vastly increased the horsepower range – yet maintained the family relationship and parts interchangeability for which GM Diesels are famous.

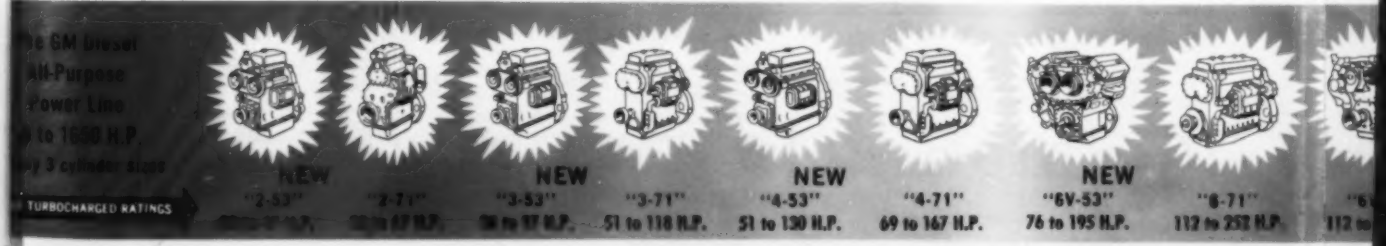
Each engine features the ultimate in *compactness, light weight, high efficiency, durability and inexpensive maintenance.*

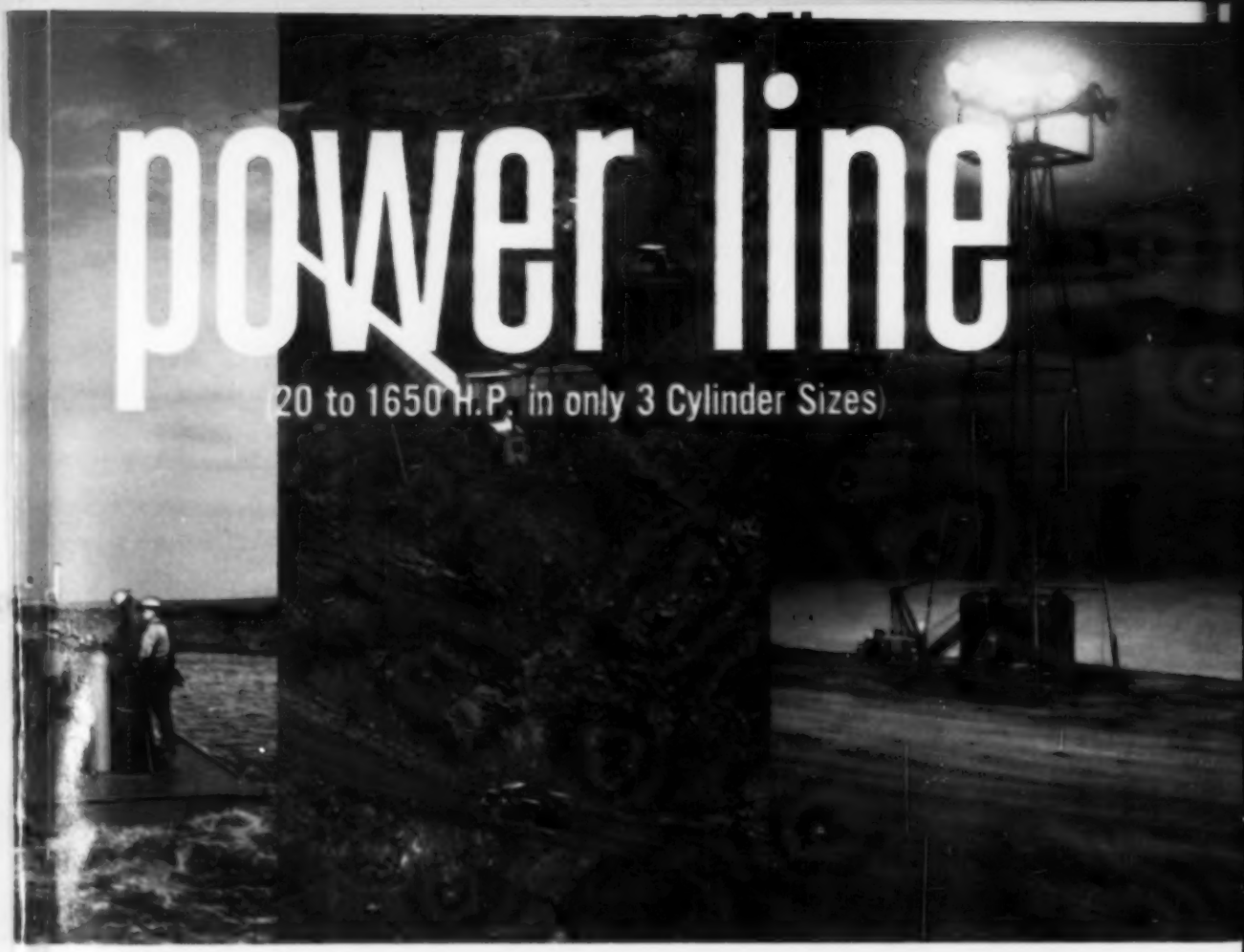
Basing their design on that of the versatile and capable GM Series 71 Diesel, GM Diesel engineers have created 8 new basic "V" and "in-line" engines which will add vastly new power coverage to the present Series 71 and 110.

First, the new Series 53 Diesel—comprising four basic "V" and "in-line" engines—is a smaller, more compact version of the famous "71."

Here, at last, in the Series 53, are Diesels which cover the lower horsepower ranges as never before. They hurdle the barriers which have limited the use of Diesel power in a whole host of applications. They offer new opportunities for Diesel power to farmers, boatowners and industrial users by making available GM Diesels particularly suited to their needs. They will pay for themselves amazingly fast when they take over from gasoline engines.

Four new "V-71" engines complete the additions—widen the power range of the "in-line" 71 Series—set new standards for low weight and small size per horsepower. These "V-71"





th its proved "Jimmy" Diesels

engines bring far more power than ever before possible to the big brutes of the construction, mining, petroleum, logging and marine industries—up to 1650 H. P. when turbocharged.

Production has started and complete programming has been established on all new engines. Non-turbocharged engines will be available first, followed later by Turbopower models to complete the power range.

So—now more than ever before, it pays to standardize on GM Diesel power. For whatever you want a Diesel to do, there's a GM Diesel to do it for you—faster, better, at less cost. Truly, here is a whole new concept in Diesel power—the All-Purpose Power Line. Get the full story by writing GM Diesel, Detroit 28, Michigan.

GM DIESEL

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GENERAL MOTORS, DETROIT 28, MICH.

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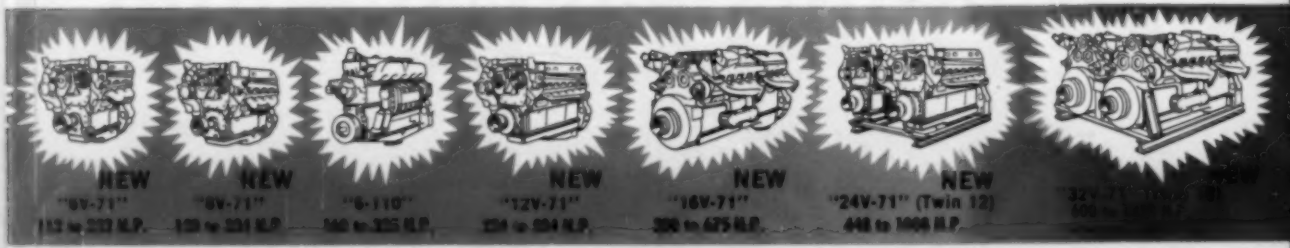

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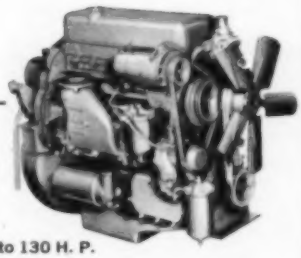
NOW...A "JIMMY" DIESEL for every power purpose

20 to 1650 H.P. in only 3 cylinder sizes

NEW SERIES 53

—smaller Diesels millions can use
2, 3, 4 and V6—20 to 195 H. P.

A scaled-down version of the famous Series 71 GM 2-cycle Diesel—identical in design principles—the new 53 Series incorporates the time-proved features of patented GM unit fuel injection and uniflow blower scavenging in more compact, lightweight units. These spacesaving engines open up whole new fields of Diesel usefulness in trucks, buses, and taxicabs, in marine service, as well as in tractors, generators, loaders, lift-trucks and many other types of industrial equipment.

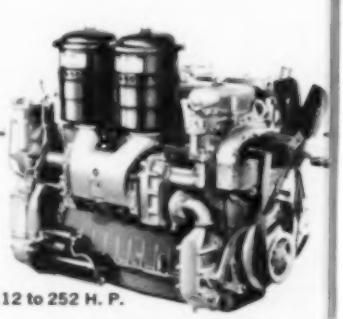


"4-53"—51 to 130 H. P.

SERIES 71 "IN-LINE"

—the versatile, time-proved economy Diesel
2, 3, 4, 6, Twin 4, Twin 6, Quad 6—33 to 1008 H. P.

Never, in industrial history, have there been Diesels as versatile and capable as the Series 71 GM Diesels—built in a wide range of Fan-to-Flywheel, Package Power, Torque Converter, Generator Sets, Economy truck engines and Turbopower models. And, because of GM Diesel's unique power concept—a family of engines featuring unequaled parts interchangeability—these time-proved "Jimmy" Diesels become even more valuable as key components of the GM Diesel All-Purpose Power Line. Today's "71" engines incorporate the results of 20 years' continuous improvement.



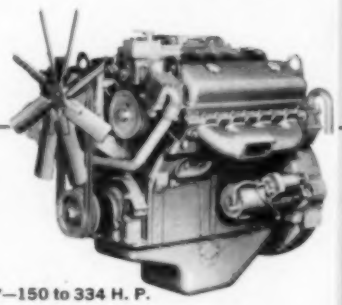
"6-71"—112 to 252 H. P.

NEW "V-71"

—higher horsepower in smaller, more compact units
V6, V8, V12, V16, Twin V12, Twin V16—112 to 1650* H. P.

The new V-71 "Jimmy" Diesels are a further dramatic illustration of GM Diesel's mighty new power concept—rounding out the All-Purpose Power Line—yet retaining the GM family relationship and parts interchangeability. Here are engines destined to give you a better investment-earnings ratio than any you have ever had before. Diesels that boast the ultimate in compactness, light weight, high efficiency, durability, inexpensive maintenance and parts interchangeability.

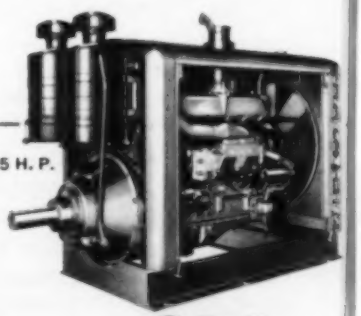
*Turbopowered



"8V-71"—150 to 334 H. P.

SERIES 110

—a favorite on heavy-duty jobs
6-110 and Twin-6-110—160 to 670 H. P.



"6-110"—160 to 335 H. P.

Renowned for its ability to get big jobs done faster at lower cost, the GM "6-110" has stepped in and taken over thousands of jobs for every kind of business—done those jobs as never before—greatly expanded the usefulness of Diesel power. Built in single- and multiple-engine units, the Series 110 engine is available for a wide variety of heavy-duty applications in earth-moving, oil-field, railroad and marine equipment.

GM Diesel
Detroit 28, Michigan
Send me detailed information on new GM Diesel All-Purpose Power Line. I am interested in new Series 53 (.....), Series 71 "in-line" (.....), new V-71's (.....), Series 110 (.....).

NAME..... TITLE.....

COMPANY.....

STREET ADDRESS.....

CITY..... ZONE..... STATE.....

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

GM DIESEL

DETROIT DIESEL ENGINE DIVISION,
GENERAL MOTORS, DETROIT 28, MICH.

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario
Parts and Service Worldwide

Specifications subject to change without notice.

Litho U.S.A.

$175?
$220?
$270?
$310?
$340?

HOW TO SAVE PER DAY...

*For packing industrial explosives

One of these figures probably comes close to the potential savings in YOUR operation when you switch from your present method to the new and improved Bemis Explosives Bags. It depends, of course, on how many holes you shoot per day, and how heavily you load the holes.

Take, for example, the figure of $270 per day savings. It works out this way: Cans cost approximately 70 cents each. Assuming you load 10 cans per hole and shoot 60 holes per day, your container cost is $420 per day.

But Bemis Explosives Bags cost only 20 to 25 cents each. At 10 bags per hole and 60 holes per day, that is $150—*a saving of $270 per day.*

Furthermore, Bemis Explosives Bags are the toughest *really waterproof* explosives bags you can find. Leave them in wet holes three days or more... and they still shoot perfectly. The Bemis extruded seamless poly liner provides the waterproofness; the tough burlap or Bemis Flexiply® (multi-ply creped kraft) outer tube supplies the strength.

Let us go into your particular problem thoroughly. Write or phone us and a Bemis specialist will see you promptly.

YOU DON'T HAVE A BAG-PACKER?

There's a simple solution to that problem . . . a Bemis Packer-Ette. The capital investment is surprisingly small. It maintains a steady production of six bags per minute. Two-man operation... substantial labor saving. Accuracy to 3 ounces on a 33-lb. bag. *Complete* cleanliness.

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GM DIESEL

71

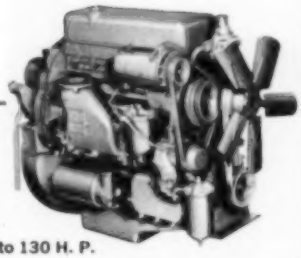
A whole new concept in power

all purpose power line

(20 to 1650 H.P. IN ONLY 3 CYLINDER SIZES "V" AND "IN-LINE")

NOW...A "JIMMY" DIESEL for every power purpose

20 to 1650 H.P. in only 3 cylinder sizes

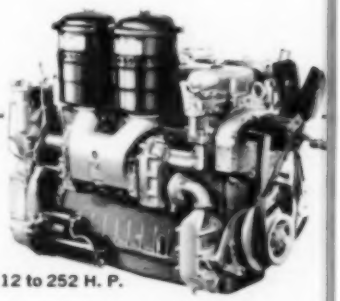


"4-53"—51 to 130 H. P.

NEW SERIES 53

—smaller Diesels millions can use
2, 3, 4 and V6—20 to 195 H. P.

A scaled-down version of the famous Series 71 GM 2-cycle Diesel—identical in design principles—the new 53 Series incorporates the time-proved features of patented GM unit fuel injection and uniflow blower scavenging in more compact, lightweight units. These spacesaving engines open up whole new fields of Diesel usefulness in trucks, buses, and taxicabs, in marine service, as well as in tractors, generators, loaders, lift-trucks and many other types of industrial equipment.

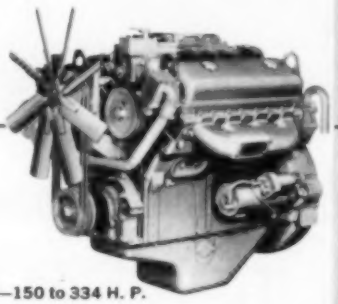


"6-71"—112 to 252 H. P.

SERIES 71 "IN-LINE"

—the versatile, time-proved economy Diesel
2, 3, 4, 6, Twin 4, Twin 6, Quad 6—33 to 1008 H. P.

Never, in industrial history, have there been Diesels as versatile and capable as the Series 71 GM Diesels—built in a wide range of Fan-to-Flywheel, Package Power, Torque Converter, Generator Sets, Economy truck engines and Turbopower models. And, because of GM Diesel's unique power concept—a family of engines featuring unequaled parts interchangeability—these time-proved "Jimmy" Diesels become even more valuable as key components of the GM Diesel All-Purpose Power Line. Today's "71" engines incorporate the results of 20 years' continuous improvement.



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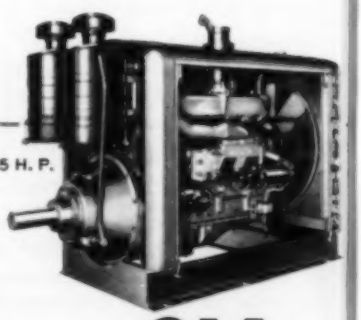

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Bemis

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Coal Abroad

Great Britain

With stockpiles very high and getting higher, drastic measures are needed to restore Britain's ailing coal industry to health.

England's National Coal Board, looking toward next year, sees only mountains of coal with fewer places to sell it. The Board, established in 1947 when the country's coal industry was nationalized, finds itself today with a cumulative loss of $71.5 million due primarily to $154 million tied up in unsold stocks. These stockpiles rose 18 million tons this year and now total about 36 million tons, reports the NCB.

What To Do—Right now, Britain's home industry is on the decline and it appears that the export market for its coal producers is all but extinct. With more and more power plants switching to oil and the expectation that 14 new plants will use five times as much fuel oil in 1960, it would be most logical, seemingly, to cut prices with the hope of influencing consumers considering the switch from coal. But there has been no sign the government will slash domestic prices. Instead it has promised to extend the Coal Board's $210 million borrowing power.

Layoffs—Aiming to cut annual coal output by about 6 million tons, NCB has said it may close 36 uneconomical mines, 25% of these opencast. The result would be to lay off about 12,000 miners, some 8,000 of which could be reemployed at other mines with the remaining 4,000 forced out of the industry. The Board predicts that production next year should then be about 203 million tons, equalling closer the demand.

French Raise Mark

Coal production is figured to hit a new high in France, perhaps over 60 million tons compared to the record 59.1 million of 1957. The national coal mines have had full employment all year despite slackened coal sales and increased stocks.

France's coal industry holds a better position than those of Germany and Belgium, says Charbonnages De France, because it has signed fewer long-term contracts with US coal exporters than the other members of the European Coal & Steel Community.

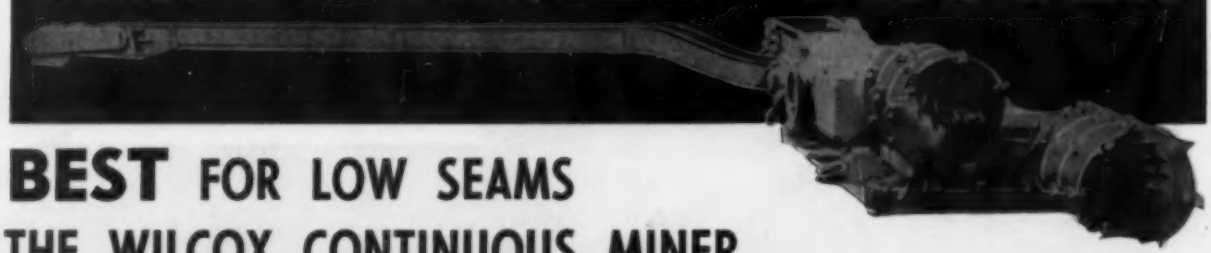
Furthermore, the price of French coal at the mine is now down to the Ruhr price level and 20% below the Belgian price, for the first time so when transport cost is added to the price, French coal delivered to the domestic consumer is cheaper than imports from Germany or Belgium.

OVERSEAS FLASHES

CANADA—Alberta coal producers are hoping that a Japanese market for coking coal will open up this year. The Crowsnest Pass area produces high quality coking coal which qualifies for Japan's steel industry, but strong price competition may be expected from Russia, China, India, Australia and the United States.

ITALY—Most of Italy's coal next year will be imported from the United States but a drop in coal consumption in the European country is expected, reflecting

TRIED - TESTED - PROVEN



BEST FOR LOW SEAMS
THE WILCOX CONTINUOUS MINER

Now in the fifth year of producing coal from Alabama to Nova Scotia and as far west as Oklahoma . . .

HAS BEEN PROVEN

- *By producing coal in seams ranging from 28 to 46 inches thick*
- *By producing coal under roof conditions where other mechanical equipment has failed*
- *By producing coal with lower maintenance cost per ton than any miner on the market*
- *By producing up to 60 tons per man per shift*
- *By its unparalleled safety record*
- *By repeated orders of 95% of our customers from 1 to 12 miners per customer*

THESE FACTS along with the low initial cost, the low 25½ inch overall height, and many other features of the Wilcox Continuous Miner have been responsible for opening many new seams throughout the country.

THE WILCOX CONTINUOUS MINER IS YOUR ANSWER FOR MORE TONS PER MAN AT LESS COST PER TON

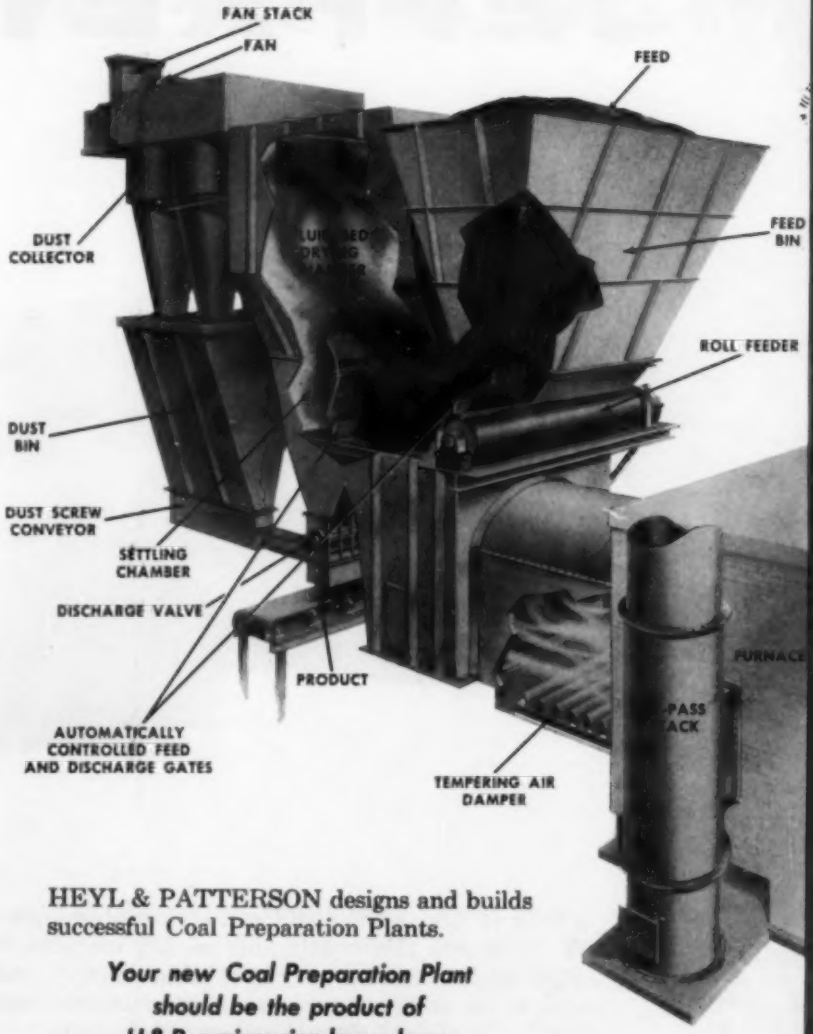
For additional information call CLifford 2-6555 Beckley, West Virginia, or write

WILCOX MANUFACTURING COMPANY

P. O. BOX 217 **RALEIGH, WEST VIRGINIA**

The H & P Fluid Bed Dryer

at Westmoreland Coal Company's Hampton #3 . . .



represents the first commercial application of FLUIDIZED THERMAL DRYING specifically designed for The Coal Industry. 4 more H & P Fluid Bed Dryers, each twice or three times as large, are now being constructed for Westmoreland and other Coal Companies.

Westmoreland Coal Has Experienced These Advantages:

1. Maintenance during nine full months of operation has been negligible.
2. The Dryer has consistently handled larger tonnages and evaporated more water than was expected.
3. Laboratory checks of size contists show that the dried product is the same size as the feed.
4. The design is so simple that an operator with little previous experience can be placed at the controls.

HEYL & PATTERSON designs and builds successful Coal Preparation Plants.

Your new Coal Preparation Plant should be the product of H & P engineering know-how.

Take advantage of this experience and phone COurt 1-0750.

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159—H & P Fluid Bed Dryer
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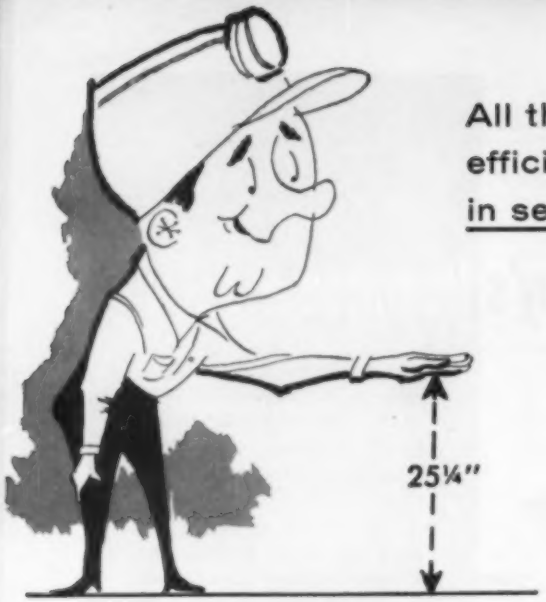
557-R—Reineveld Fine Coal Dryer



All the benefits of fast, efficient, continuous mining... in seams as low as 28 inches

JEFFREY

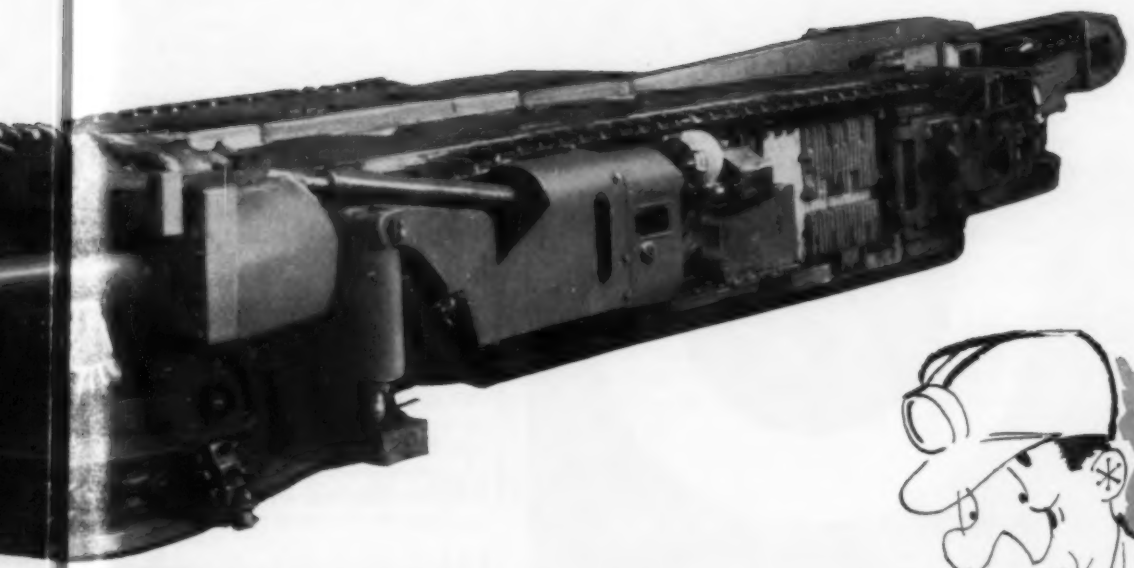
Makes a cut 14' 7" wide

ALL THE time-saving and cost-saving advantages are built into this continuous mining machine. The Jeffrey 86-A Colmol is only 25¼-inches high . . . mines seams as low as 28 inches . . . makes a cut 14-feet 7-inches wide . . . gives good cleanup and smooth bottom.

Specially designed cutting and gathering chain carries coal to the center of the "Colmol", then up and onto the swinging discharge conveyor. It smooths off the cusps, even when the breaker-arm head is raised 8 inches for maximum adjustment of mining height.

This powerful, compact Colmol advances with minimum maneuvering. Coal is broken from the face . . . not ripped

Y86-A COLMOL



or ground off. You get good overall screen consist, greater speed and efficiency. Colmol withstands the most severe mining conditions, operates with little noise or vibration.

All adjustments are hydraulic, can be made instantly and accurately. Easily accessible parts simplify adjustment and servicing. Safety features provide extra protection for both personnel and machine.

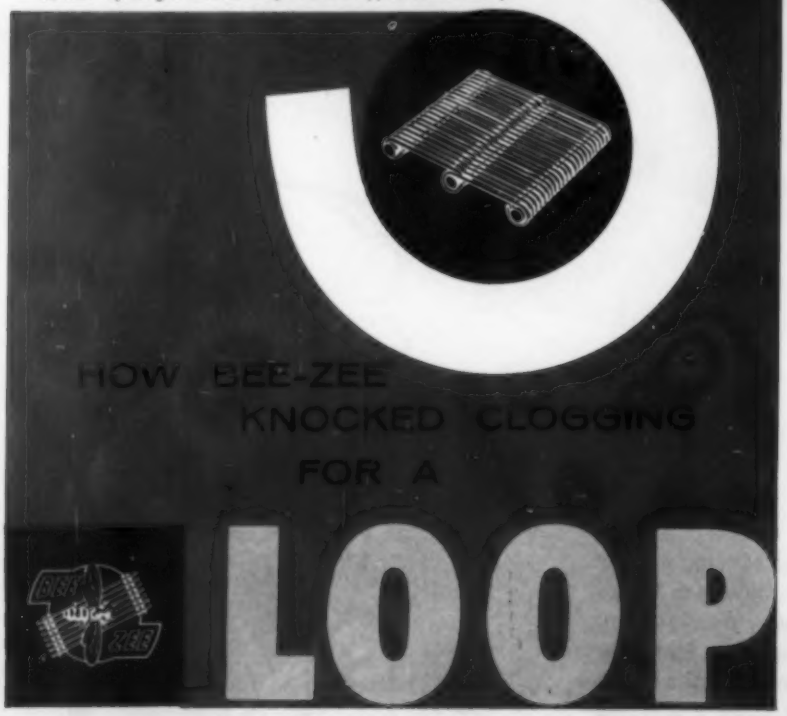
For low seams... or seams up to 8 feet high— efficient, easy-going Jeffrey Colmols step up your production rate, cut operating and maintenance costs. Write for full details. The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.

Low maintenance

MINING • CONVEYING • PROCESSING EQUIPMENT...
TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

JEFFREY

NEW BEE-ZEE BH LOOP SCREEN is non-rigid to prevent clogging. Short, individual screening rods are looped – not welded – around tie-rods. Spacing is controlled by washers slipped between loops.



To give mine operators a solution to extreme clogging problems, Bee-Zee engineers produced a new type of screen operating on entirely new principles. Bee-Zee's BH Loop Screen is made up of "loose" segments that multiply the action of a vibrator. Clogging is prevented without distorting accuracy.

Whether your own screening problems are highly unusual or "run-of-the-mine", Bee-Zee Screens can provide the answers—and make you money. Screening rods can be round, triangular or specially shaped. Electronically controlled welding fuses them to tie rods to form screens in all shapes, sizes and dimensions. Type or make of screening equipment is never a problem.

Write, wire or phone DIckens 2-5154. Ask for a specific recommendation or one of the complete Bee-Zee catalogs – or both.

BIXBY-ZIMMER ENGINEERING COMPANY
119 Abingdon Street, Galesburg, Illinois

Coal Abroad *(Continued)*

the trend to shift from coal to oil. Italy's Coal Committee has set at 2,772,000 metric tons the country's coal needs for the first quarter of 1959, 200,000 tons less than the fourth quarter of 1958.

GERMANY—An industrial firm in this country has reportedly received an order to build a nitrogen fertilizer plant in South Korea that will use anthracite as a raw material. With operations scheduled to begin in 1961, expected annual production is set at about 85,000 tons of urea.

RUSSIA—An automatic X-Ray separator which will mechanize extraction of rock from high-grade coal is reported near completion at a Russian selenium rectifier plant. Operated by remote control from the mine office, the apparatus continuously examines materials moving along conveyors and sends impulses to mechanisms which separate the coal from the rock, according to the description.

GREAT BRITAIN—The $17 million Lurgi gasification plant long in the planing state is scheduled for immediate construction at Coleshill, Warwickshire, Eng., say reports. The new plant, to be in operation in 1962, will have an estimated daily output of 30 million cu ft.

FRANCE—French mining engineers will help Argentina raise coal production in the Rio Turbino Basin from 250,000 to 3 million tons, according to reports. Twenty-seven engineers will leave soon to begin the 5-yr project.

Three Faces of Crippling

Birth Defects Arthritis Polio

JOIN THE
MARCH OF DIMES
TOWARD GREATER VICTORIES

A 9-ft. deep undercut . . . and four 9-ft. blastholes

Kennametal U10 Cutter Bits, mounted in a Joy 11RU Universal Cutter, cut rapidly across the face, leaving a coarse slack with few fines. These bits, with narrow inserts that draw a small power load, are reground an average of 10 times.

After undercutting, four blastholes are drilled into the face, using Kennametal DL 1⅞" Drill Bits on a Schroeder Hydraulic Drill. Completing a 9-ft. hole takes less than half-a-minute actual drilling time.

IN FIFTEEN MINUTES . . .

two men cut and drill this 18-ft. face . . . using KENNAMETAL* Bits

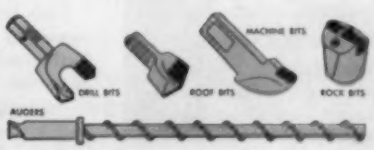
At the Wyatt-Seanor Mining Company, near Saltsburg, Pa., two men in each section cut and drill coal for two Joy 14BU Loaders and three shuttle cars. In maintaining this pace, where the Upper Freeport "E" Seam runs between 42-in. and 47-in. thick, it takes these two men an average of 15 minutes to prepare an 18-ft. face, from the time they start their sump to the completion of the final blasthole.

Using a conventional mining cycle—undercutting, drilling, shooting and loading out—this mine realizes a remarkable shift tonnage of 32 tons for each man at the face.

Ask your Kennametal Representative how the "Yellow Bits" can improve your production. Let him help you select and actually test in your mine the Kennametal Bit designed to best match your operating conditions. Call your Kennametal Representative or write KENNAMETAL INC., Mining Tool Division, Bedford, Pa. 8767

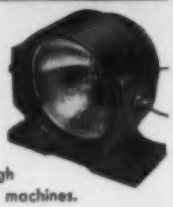
*Trademark

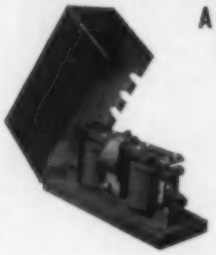
INDUSTRY AND
KENNAMETAL
...Partners in Progress



EXPECT the BEST
from all
FLOOD CITY
PRODUCTS

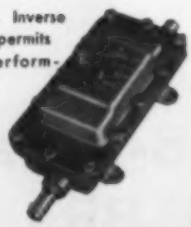
HEADLIGHTS
6, 32 and 115 V.
Sealed beam throws powerful light which does not dim with use. Sturdy, long life enclosure suited for rough use on mine locos and machines.





AUTOMATIC TRANSFER SWITCH
Simple, compact.. designed to perform efficiently under hard use. Completely automatic, the proper circuit is always connected to the power source, whether cable or trolley. Cover is dirt and drip-proof.

"NO-FUSE" TYPE PERMISSIBLE STARTER
For gaseous mines. Inverse time limit element permits maximum motor performance with positive protection. In event of overload it is only necessary to move handle to "reset" position, no fuse to change.



FUSED ALL-PURPOSE SWITCH
70 to 400 amp

For any D. C. Safety Switch application at less initial cost. Compact, sturdy, and thoroughly sealed against moisture. Also made as two circuit-junction box.

FLOOD CITY
BRASS & ELECTRIC CO.
JOHNSTOWN, PA.
SALES AGENT:
KANAWHA RAIL & MACHINERY CO.
CHARLESTON, W. VA.

Current Coal Patents

By Oliver S. North

Method of ventilating the producing areas of a coal mine, J. F. Joy (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Nov. 11, 1958. Improved method of ventilating a coal mine in which the inverted longwall system of mining is used. A bore is formed in the seam parallel with and just ahead of the coal face, and this bore is extended between adjacent parallel roadways or panel entries, so that ventilating air may flow from entry to entry. Parallel breakthroughs are driven from the face to the bore and from one bore to the next, thereby providing adequate ventilation for productive areas. Falls and gob lines are also ventilated, thus preventing accumulations of gas. No. 2,859,682.

Apparatus for cleaning coal or other granular material, A. A. Hirst (assigned to Coal Industry (Patents) Ltd., London, England), Nov. 11, 1958. In this improved Menzies cone separator, the fine coal in a washery slurry can be recovered from the accompanying fine dirt, and crude unsized coal can be cleaned efficiently. No. 2,859,872.

Process for re-wetting water-wetted solid particles, W. Reerink, W. Müschenborn and E. Nötzold, Nov. 11, 1958. Process for replacing with an oil film the water film of water-wetted coal fines, wherein the mixture of fines, oil, and water is subjected to shearing and frictional forces. The mixture is forced as a thin film through a zig-sag labyrinth path between profiled surfaces rotating in opposite directions, thus subjecting the film to great shearing and frictional forces every time the flowing film changes direction in the path. No. 2,859,917.

Method of mining involving four isolated sections, J. F. Joy (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Nov. 11, 1958. Improved method of mining coal by the full retreat longwall system, wherein initial development work is carried to the boundaries of the mine acreage in order that mining may begin concurrently or separately at the four remote corners of the property. The productive areas are effectively independent of each other, yet may use common mine entries and ventilation systems. No. 2,859,953.

Coal testing method, H. Dijkstra (assigned to Stamicarbon N. V., Heerlen, Netherlands), Nov. 11, 1958. Method of testing coal to determine its content of incombustible matter. The ash content is derived by means of the Roentgen ray dispersion capacity of the coal. This method, which is of particular value in the automatic, continuous control of coal dressing practices, yields substantially reliable results in spite of marked iron content fluctuations, and can be successfully applied to raw run-of-mine coal of any type. Nos. 2,860,252 and 2,861,188.

Swivel coupling, C. N. Bebinger (assigned to Joy Mfg. Co., Pittsburgh, Pa., Nov. 18, 1958. Design for an improved swivel coupling for connecting two coal conveyor sections so that they have free swinging movement relative to each other through a range of swing up to 180 degrees therebetween, while insuring proper delivery of material. No. 2,860,765.

Process for separating a mixture of solid particles, F. J. Fontein (assigned to Stamicarbon N. V., Heerlen, Netherlands), Nov. 18, 1958. Improved continuous process for separating mixtures of solid particles, particularly raw coal, into fractions according to specific gravity by means of a suspension consisting of magnetisable particles. The viscosity of the separating suspension is kept low, and the whole mixture is treated in one separator. Suspension medium losses are very low. Recirculation of coal fines to the hydroclone separator is reduced or avoided entirely by operating with the thickener intentionally overloaded. No. 2,860,782.

Mining cutter bit having a resilient tongue, A. O. Bruestle and C. B. Krekeler (assigned to The Cincinnati Mine Machinery Co., Cincinnati, O.), Nov. 18, 1958. One-piece cutter bit for a mining machine, for use in a tapered socket. The bit has positive retention in the shank of the socket, yet is not more difficult to remove than other bits of this type. No. 2,860,863.

Roof supports for mine workings, A. Durcan (assigned to The Mining Engineering Co. Ltd., Worcester, England), Nov. 25, 1958. A mine roof support comprises two or more superimposed resilient or deformable cylinders adapted to roll upon each other and upon the surfaces of the roof and floor, so that the roof is supported by direct transmission of the load through the cylinders. No. 2,861,429.

Conveyor with coacting conveyor belt, K. Sandgänger, Nov. 25, 1958. Conveyor especially designed for moving coal or other lumpy material on a relatively steep upward gradient, for instance,

WICKWIRE *Refined*

DOUBLE GRAY

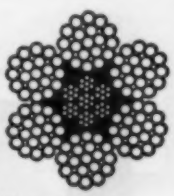
. . . extra high strength

wire rope gives you increased resistance to

ABRASION
PEENING
CRUSHING

Double Gray* *extra*-improved plow steel rope will give you *extra* service life . . . where abrasion shortens rope life . . . where peening action on rope wires causes them to flatten out and split . . . where crushing against drums, sheaves, or adjacent wraps of rope deforms individual wires, restricting the very necessary minute free rotation of individual wires during rope use.

Double Gray was carefully *refined* over several years, and tested extensively on the largest, most powerful wire rope fatigue-testing machine in operation anywhere, *before* it was released to the field. The resultant harder, stronger steel has given Double Gray *extra* resistance . . . resistance that enables Double Gray to quickly repay its slightly higher initial cost in longer life and increased safety.



**Wickwire Double Gray Wire Rope is made of extra-improved plow steel. Fortified by an independent wire rope core of the same extra high strength steel, Double Gray has a 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.*

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LOOK FOR THE YELLOW TRIANGLE

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THE COLORADO FUEL AND IRON CORPORATION

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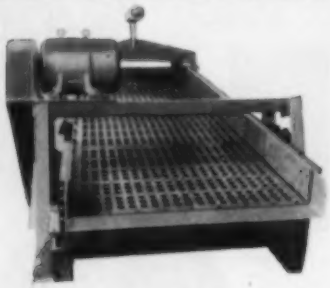
HENDRICK H QUALITY STEEL PLATE SCREENS COAL MORE ECONOMICALLY



Tough and rugged Hendrick H Quality Steel Perforated Plate lasts longer, even under continuous and heavy-duty use, because it is made from heat-treated high-carbon steel. It screens coal easier and faster, while the full clearance of its perforation reduces downtime costs due to blinding. Product uniformity is assured throughout the life of the screen. For all these reasons, Hendrick H Quality Steel Plate can make the difference between profit and loss in coal preparation. Order Hendrick H Quality Steel with either flat, corrugated, or stepped surfaces, in any desired shape and with any size of perforation. Whatever you order, you get Perforated Plate which reflects Hendrick's 82 years of experience in selecting the steel the mining industry needs.

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MANUFACTURING COMPANY

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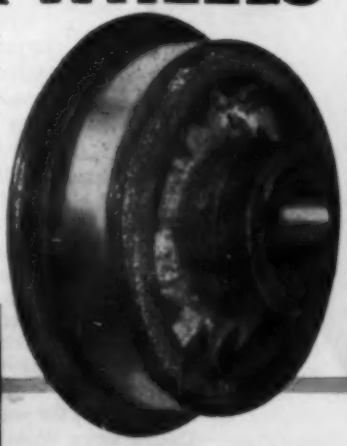
acf Load-support MINE CAR WHEELS

Quick-chilling after casting gives acf Chilled Tread Car Wheels extra resistance to abrasion and wear, gives you real economy through long service life. Gray iron center costs less to mount, reduces vibration and effects of stress concentration. Curved plates support tread at load center: minimize damage to treads.



Cross Section of acf "Load Support" Mine Car Wheel showing: (1) uniform depth of hardening, (2) extra heavy overhang, (3) support at center of tread.

For further information, just ask your acf representative.

AMERICAN CAR AND FOUNDRY

DIVISION OF ACF INDUSTRIES, INCORPORATED
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Patents *(Continued)*

gradients of more than 20 degrees. A secondary belt is arranged above the regular conveyor belt in such manner as to lie flat on the material being transported, thus acting as a mat to hold the material in place. No. 2,861,673.

Mine roof bolt installation, J. B. Dempsey, Dec. 2, 1958. Design for a mine roof bolt installation embodying a conduit hanger having improved means for detachably securing the hanger to the bolt washer. No. 2,862,368.

Extensible conveyor, J. Craggs and K. McCann (assigned to Goodman Mfg. Co., Chicago, Ill.), Dec. 2, 1958. This extensible belt conveyor has novel control means for maintaining the wire rope support frame within desired limits of tension, and also for paying out additional lengths of rope framing as the conveyor is lengthened. No. 2,862,604.

Suspension idler, C. Stamos and J. J. Huey (assigned to The United Electric Coal Companies, Chicago, Ill.), Dec. 2, 1958. Design for an extensible flexible suspension idler which operates smoothly at high speeds without "bump" or sideway. When the load is deflected, it is promptly thrown back to the center of the belt by horizontal forces inherent in idlers suspended in catenary fashion. Belt wear and maintenance are reduced. No. 2,862,607.

Troughing roller assembly for belt conveyors, J. S. Newton (assigned to Goodman Mfg. Co., Chicago, Ill.), Dec. 2, 1958. Design for an improved troughing roller assembly characterized by interconnecting rollers arranged for free articulating and rotating movement, the outer ends of the outer rollers only being required to be mounted upon a shaft or bearing. Other adjacent roller connections are made with a bail, ball, and socket arrangement. No. 2,862,608.

Boring type miners with cutting path modifying means, J. J. Slomer (assigned to Goodman Mfg. Co., Chicago, Ill.), Dec. 2, 1958. In this boring type miner, means are provided for augmenting the cutting action of the arms for either effecting a turn of short radius or effecting a wider cut. The fluid for operation of the crawler tread motors is augmented, preferably automatically, by an additional pulse or surge of the pressure fluid. No. 2,862,699.

Boring type miner, J. Gonski (assigned to Goodman Mfg. Co., Chicago, Ill.), Dec. 2, 1958. Boring type miner having an auxiliary means, adjacent to the conveyor receiving throat, for fragmenting large pieces resulting from action of the boring arms. No. 2,862,700.

IT'S AMOCO ALL THE WAY
AT THE BRIDGEVIEW COAL COMPANY!

Another mining company that lubricates exclusively with Amoco!
Mining equipment has become more and more specialized with every passing year. And of necessity, so has lubrication.To get the best lubricant for every job, the Bridgeview Coal Company uses Amoco Lubricants right down the line: Amoco Superior Diesel Oil S-3, Amoco HDX Oil, Amotorque Fluid and Amoco Greases, as well as Amoco Fuel Oil.

Why choose Amoco over all others? Because a piece of machinery is only as good as the lubricants that keep it operating! And Amoco Lubricants are the best!

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LUBRICANTS
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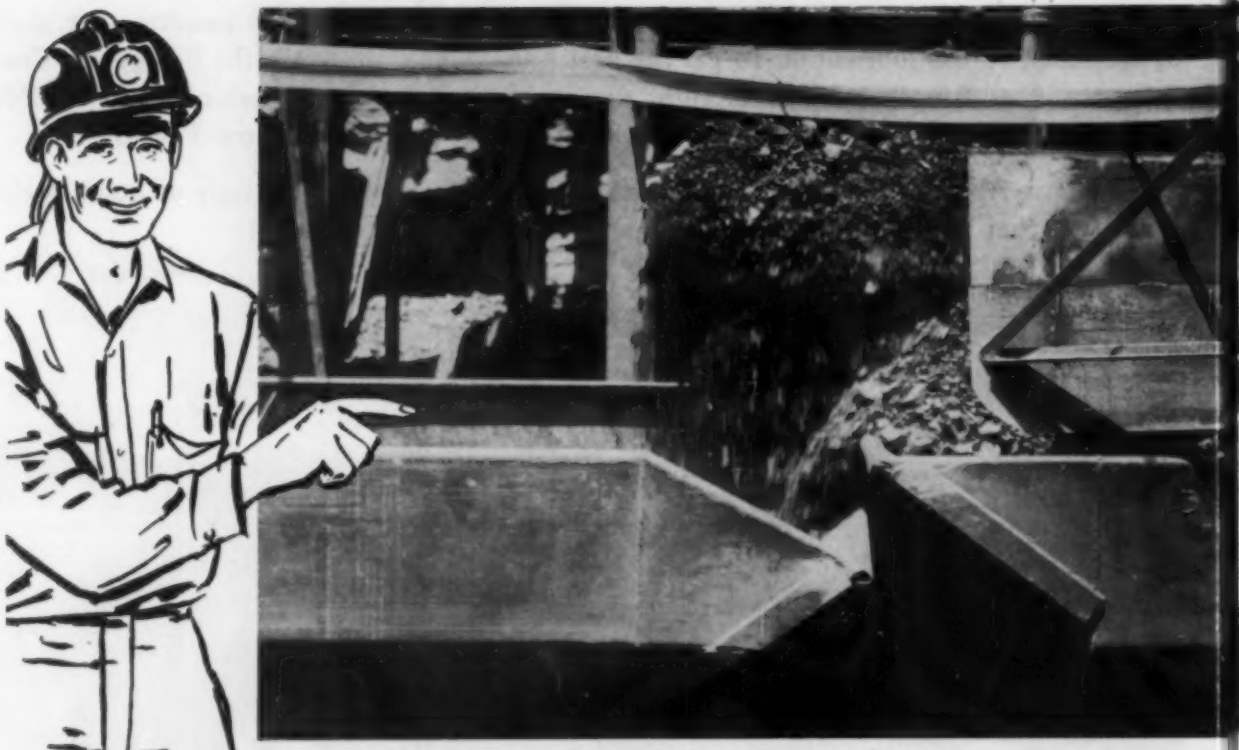
HIGHER QUALITY...FOR BETTER LUBRICATION...AT LOWER COST

"Here, in unretouched pictures, why S-D Automatic 'Overlapping haulage cost to the



Note coal continues to flow from chute directly over exclusive S-D Automatic "Overlapping Ends" — without spillage between-cars. Photographer shot this picture while trip was in-movement.

This still-shot shows the Top Dresser Bar and Side Dresser Plate, which automatically dress the cars as they are automatically loaded!

is shown one of the basic reasons End' Cars will reduce your absolute minimum..."

We had chute discontinue loading at the moment this picture was shot so you could see that in actual operation two things take place: (1) as mentioned, flow of coal continues uninterrupted and also (2) after dressing car to underground haulageway height, surplus coal is plowed into next car in trip—thanks to S-D "Overlaping Ends."

EVERY YEAR, without exception, more mines convert to the S-D Automatic Car Haulage System. What are the reasons?

1. Since the mining operation at the face and the preparation of coal for shipment are separate and distinct functions, operators want them to be carried on independently, so that each may operate in the most economcial manner . . . in other words, so that no interruption or slow down in one will interrupt or slow down the other. They want the system that will continuously remove coal from the loading point as it is mined, and, at the same time, will provide a continuous supply for the preparation plant. Automatic Bottom Dumping Mine Cars are the only known means of low cost coal mine transportation that will allow a continuous movement of coal from the face, or loading point, to the railroad car. Reason for this is because these cars are the only method of haulage that can use a low cost, low maintenance, large capacity SURGE BIN, which serves as a temporary storage for coal in transit and thereby balances the mining and preparation operations.

Automatic Dumping ON-THE-MOVE!

2. Lower initial capital cost — 40% fewer cars required . . . fewer locomotives . . . rotary dump requires special dump at high cost . . . cleaning plant may be of smaller capacity because it does not have to handle all the coal as quickly as it is mined.

3. Lower operation cost — fewer cars, fewer locomotives . . . no rotary dump to operate and maintain . . . no dumping labor, and with S-D "Overlapping End" Cars no loading labor!

4. Greater flexibility — cars of any size and dimension can be dumped over same SURGE BIN, provided each has same track gauge, of course. Double tracks can be used over bin where desirable. No tilting chutes or other similar mechanisms required at loading points; therefore, less headroom and less capital cost, plus minimum time required for moving loading set-up! No other coal haulage system gives the flexibility provided by Automatic Bottom Dumping Car Transportation!

These are some of the fundamental reasons why the S-D Automatic Bottom Dumping Car Haulage System reduces cost to the absolute minimum. How much can you save? We recommend a fact-finding survey by our Application Field Engineer. No obligation, of course. May we get together? Write or call us today!

Sanford-Day Iron Works, Inc., Knoxville, Tenn.

SANFORD-DAY

KNOXVILLE, TENNESSEE

News Roundup *(from p 28)*

mined next year for electric utilities, an increase of 7.1% for the country's largest coal consumer, while steel, already back to its 1957 production rate, should take about 105 million tons of coking coal in 1959, an increase of 36% from this year.

Other industrial use of coal is expected to gain 1.4% to 106 million tons. Some users such as cement manufacturers, who will benefit from the multibillion dollar highway program, will increase their demand for coal; others, such as railroads, will continue as a declining market, declares the committee.

The forecasters state that the retail market should take about 30 million tons next year, about 3.6% less than 1958. The export market, though difficult to predict because of "political overtones," is expected to take about 46 million tons, a decline of 8.9%.

Anthracite Talks

It was hinted as we went to press that negotiations might drag on to mid-January in the anthracite contract talks.

One of the major issues is the miners' request for a boost of the present 50c royalty paid by the operators into the welfare fund on each ton of coal to $1. Operators reportedly feel that the raise, if agreed to, may not solve the problem in that there has been a marked drop in production and a corresponding decrease in the total number of men working in the industry.

Another issue before the two sides is the curbing of non-union independent mining, particularly in the lower coal fields. Both sides are said to feel that this condition has reached the point where it is most difficult to change.

Smelting Studied

A study on electric furnace use in smelting iron ore is now in progress due to the interest of some 20 electric utility, steel, and furnace equipment manufacturing companies. The researchers have these objectives:

1. To evaluate the present position and probable future status of processes for the electric smelting of iron ore in the United States.

2. To determine the conditions under which electric smelting can be used profitably in the United States for the manufacturing of pig iron, cast iron and/or steel.

3. To find the relative advantages of the blast furnace and the electric-furnace processes for potential users with different interests.

4. To develop and analyze information needed in planning for expansion, market development and research programs.

"The technical feasibility of a number of the so-called 'direct reduction' processes using electric furnaces has already been established," declare Battelle technologists Raymond W. Hale and Naaman H. Keyser. "We know that, with these processes, it is possible to produce pig iron directly from iron ore. The question still remains, however, whether iron users would be better off using iron produced by the conventional blast-furnace process or by one of the electric furnace direct-reduction processes. We hope to weigh the advantages of these alternatives in a number of situations."

Studies show, the Battelle experts say, that the cost of producing pig iron by electric direct-reduction processes is generally higher than the cost of production in a blast furnace, but there appear to be situations where costs by the two methods are competitive. Such situations, which involve conditions favorable to the use of electric furnaces, include: low-cost electrical energy; availability

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A STEEL SHELL that leads the way in...
TIGHTENING...HOLDING POWER...RELIABILITY
You can cut your bolting time and bolting costs as well by using "Top-Tite" shells. "Top-Tite" gives you maximum expansion in minimum time!
Have you had trouble with plug pull-out... leaf breakage ...misalignment? Instead of merely lessening these problems, "Top-Tite" eliminates them. Experienced roof bolting engineers are ready to help you with your bolting problems. Call or write National Mine Service today!
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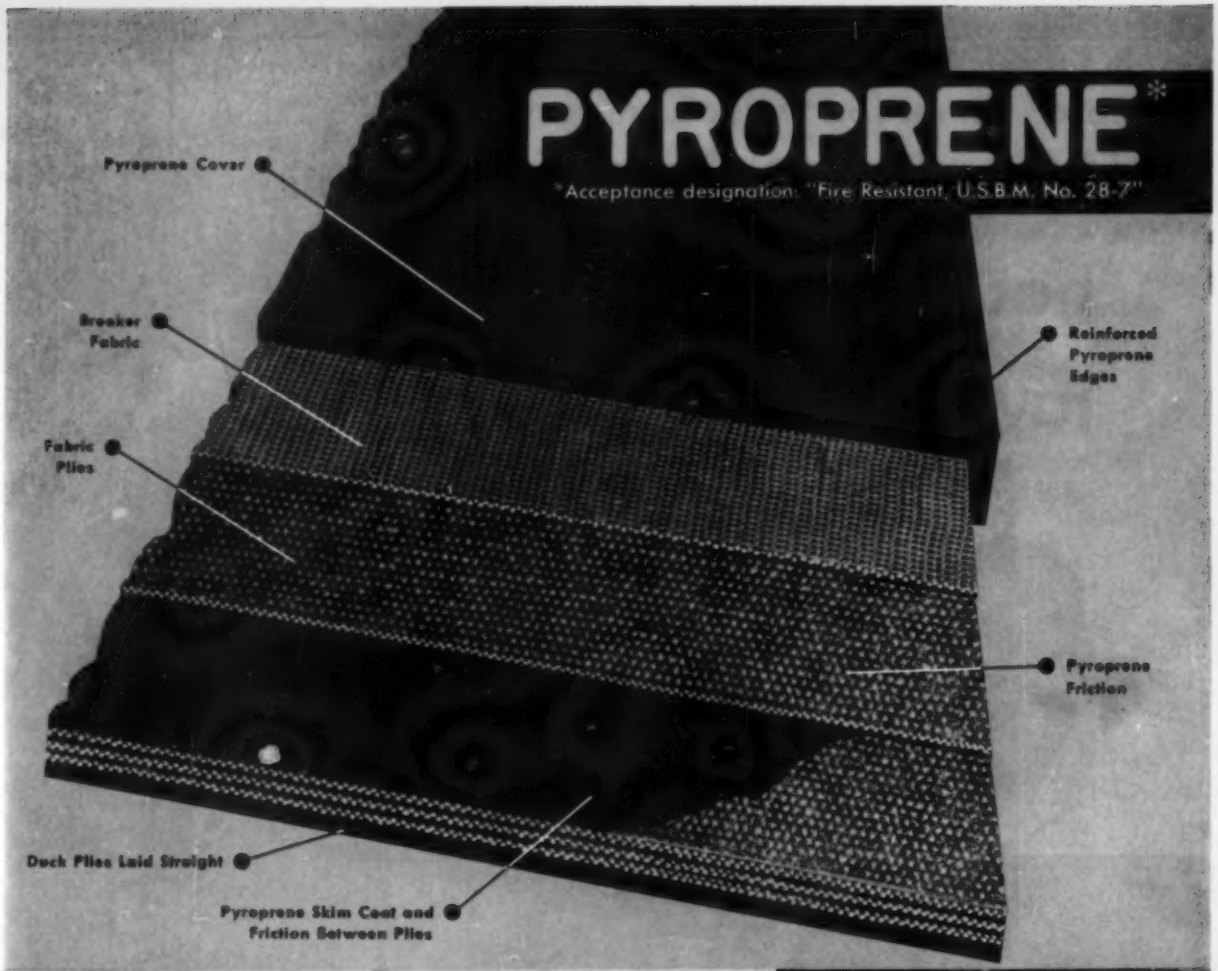
PYROPRENE*

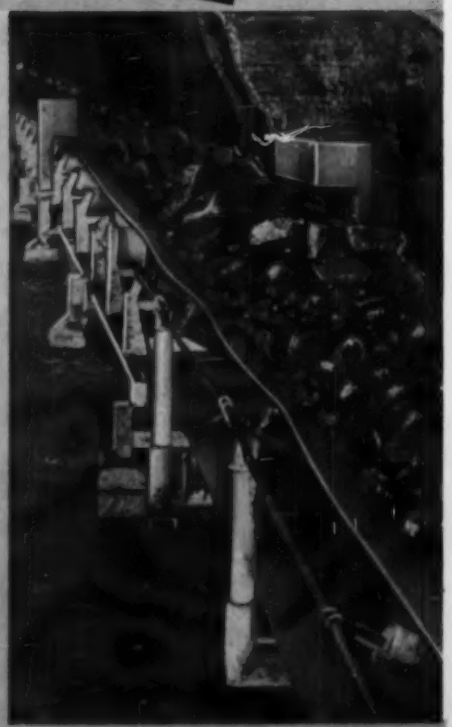
*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-7"



What happens if fire penetrates to the carcass of a conveyor belt?

It goes out if it's a Hamilton Pyroprene belt. Fire just can't find fuel to feed on in this U.S.B.M.-accepted belt because every element is "Pyroprene Protected". The cover is all Pyroprene. The fabric plies and the breaker fabric are completely encased with 100% Pyroprene compound before the belt is built.

In addition to fire resistance, Pyroprene belting offers exceptional durability and strength. The cover will give maximum resistance to cuts, tears, gouging and abrasion; reinforced edges protect carcass at critical wear point. Breaker fabric acts as cushion for impact. Fabric plies are strength members. Skim coats increase adhesion and prevent ply separation. Write Dept. MI-105.



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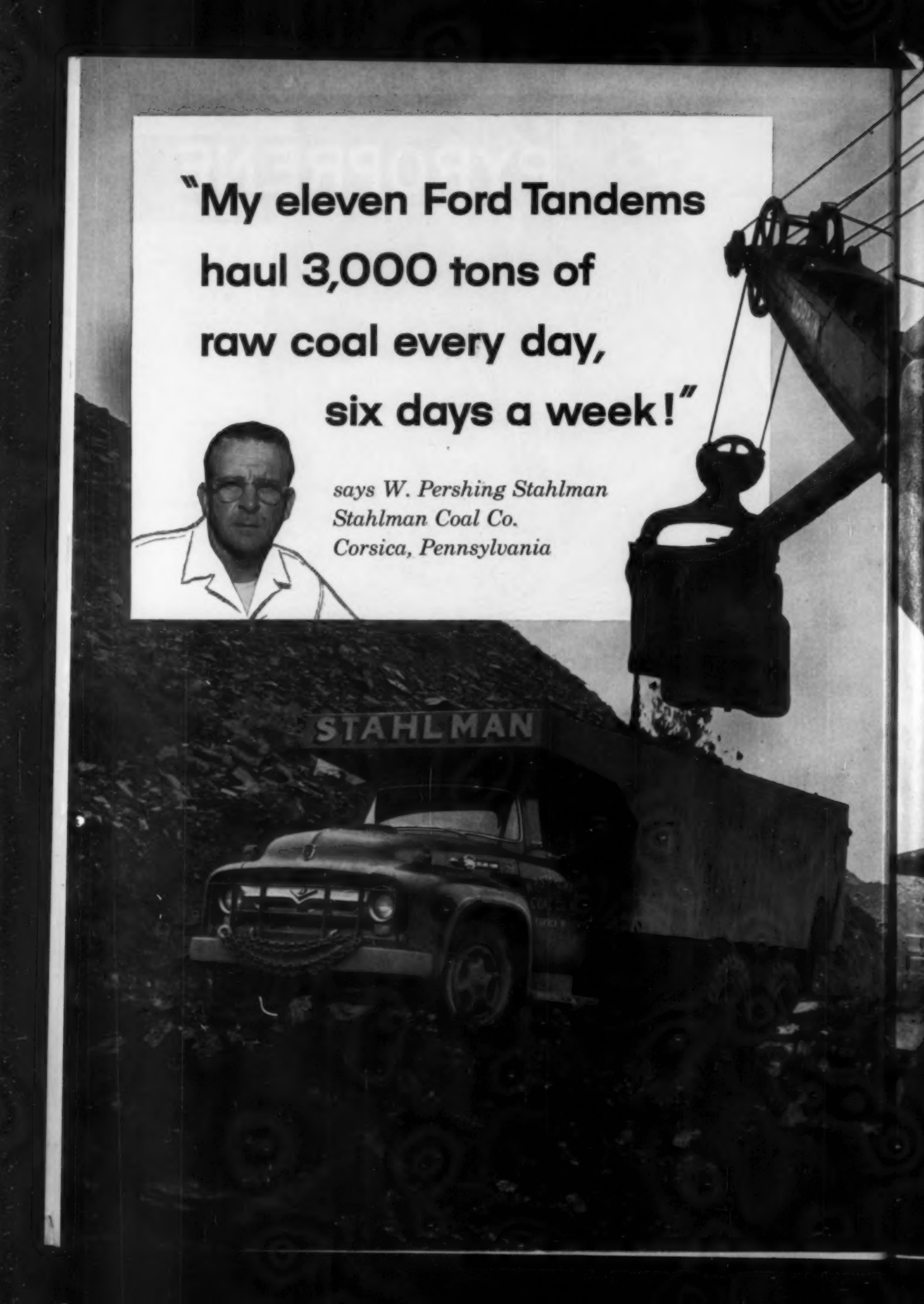

"My eleven Ford Tandems
haul 3,000 tons of
raw coal every day,
six days a week!"
says W. Pershing Stahlman
Stahlman Coal Co.
Corsica, Pennsylvania
STAHLMAN

Every Ford has SAFETY GLASS in every window

"I can't afford unreliable equipment. And rough going doesn't bother my Fords. Many have over 200,000 miles on 'em!

"My Ford tandem fleet hauls raw coal from three strip mines to the washing plant and loading bins. Working 10,000 acres, and feeding one of the largest washing plants in the country calls for super-dependable trucks. They must climb steep grades coming out of the pits with 18-ton payloads. It's a tough operation, requiring lots of brute power and stamina. Ford Heavies really do the job, and with a minimum of expense.

"Power steering is a wonderful Ford tandem feature. My drivers like the handling ease it gives on mud and shale roads.

"22 years of experience in the trucking business has taught me the value of Fords. And I've got 2 new '59 Ford T-800's on order."

Go Ford-ward for savings with '59 Ford Trucks!

NEW FORD 4-WHEEL DRIVE PICKUPS are excellent personnel and equipment carriers for punishing off-road and mining operations.

Whatever your job . . . wherever you do it—you'll find Ford Heavies and Extra Heavies are engineered and built to do it better! And the '59 improvements in these models give you still more benefits.

Factory installed tractor package custom-fitted to Ford trucks for safer, more dependable braking.

New internal shoe parking brake has nearly 50% greater stopping and holding ability, requires less than half the operating effort needed for previously used type.

Higher payloads and longer axle life with new, higher capacity front and rear axle options.

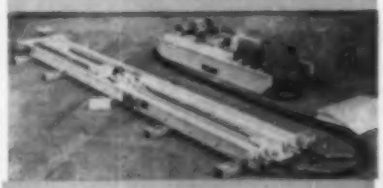
Greater operating economy with faster axle ratios and wider choice of transmissions.

Yes, the new '59 Ford trucks are here to take you *Ford*-ward for savings, *Ford*-ward for modern style and stamina. See your Ford Dealer today!

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

Over 200 NOLAN PORTA-FEEDERS now in use by leading mine operators in America!



NOLAN PORTA-FEEDER

EXCLUSIVE AND OUTSTANDING FEATURES:

- Push-button operated
- Mounts on top of ties
- No excavation necessary
- No valves on track unit
- Cushioned anchorage
- Hydraulically protected from shock and overload
- Simplified hydraulic system
- Constant forward feeding motion
- Close-centered dogs
- Secured by rail clamps with shock-absorbing springs. No holes required in rails
- Shortest on the market—only 6 feet longer than mine car!

The only COMPLETE line of car-spotting and car-loading equipment available!

NOTE: Nolan makes a special model for drop-bottom cars

Nolan also makes a HOLD-A-TRIP for down grades.

WRITE FOR FREE CATALOG!

NOLAN

THE NOLAN COMPANY
106 Pennsylvania St., Beaverton, Ohio

News Roundup *(Continued)*

of low-cost coal or fuel gas; poor availability or high cost of metallurgical coke; relatively low desired capacities—roughly 100 to 400 tons of iron per day; and a need for small capital investment per ton of capacity.

Companies participating in the study include: The Cincinnati Gas & Electric Co.; Cleveland Electric Illuminating Co.; Copperweld Steel Co.; Detroit Edison Co.; Granite City Steel Co.; Great Lakes Carbon Corp.; Houston Lighting & Power Co.; Illinois Power Co.; Interlake Iron Corp.; Kaiser Steel Corp.; Keystone Steel & Wire Co.; Laclede Steel Co.; Lukens Steel Co.; National Carbon Co., Div. of Union Carbide Corp.; Ohio Edison Co.; Philadelphia Electric Co.; Pittsburgh Steel Co.; Sharon Steel Corp.; Swindell-Dressler Corp.; Union Electric Co.; and West Penn Power Co.

Mines, Companies

Pittston Co. has purchased the Elk River Coal & Lumber Co. which operates coal mines in Clay County, W. Va.

About 1,000 men are employed by the Elk River Co. which has been operating in the county for more than half a century. Pittston has not announced its immediate plans for the mine.

The Brimac Corp., a new coal mining concern, has bought mineral rights on land near Carbonton, N. C. and is reportedly planning extensive coal mining operations.

In preparation, 20 tons of sample anthracite have been mined and used in two local business concerns' boilers to test the coal, says Glenn Arter, one of the corporation members. The mine is located near the old Gardner mine which ceased operations 30 yr ago. The coal will be strip mined.

Transportation

The Youngstown Coal Pipe Lines Co. has announced it plans to construct a 30-mi coal-carrying pipeline from East Liverpool to Youngstown, Ohio.

Construction on the line, to cost $10 million, is scheduled to start in the spring. The pipeline will, according to reports, be able to carry 33 million tons of coal a year.

Pittsburgh-Midway Mining Co.'s Paradise mine preparation plant transports coal with what is said to be the first "turnover" conveyor belt system ever used for long-distance hauling.

Bituminous Output

YEAR TO DATE	PRODUCTION
Dec. 13, 1958	378,784,000
Dec. 14, 1957	473,942,000

1958 output 20.1% behind 1957.
A month earlier output was 21.3% behind 1957.

WEEK ENDING	PRODUCTION
Dec. 13, 1958	8,960,000
Dec. 14, 1957	9,171,000

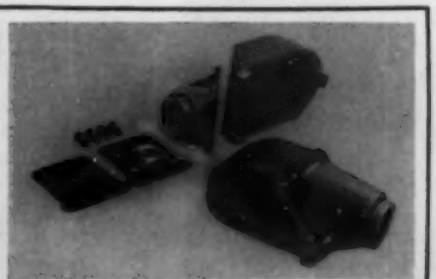
Anthracite Output

YEAR TO DATE	PRODUCTION
Dec. 13, 1958	20,499,000
Dec. 14, 1957	24,445,000

1958 output 16.1% behind 1957.
A month earlier output was 17.1% behind 1957.

WEEK ENDING	PRODUCTION
Dec. 13, 1958	507,000
Dec. 14, 1957	481,000

CAST ALUMINUM Guyan STRAINERS



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TWO and THREE INCH SIZES
Write for literature

Manufactured by GUYAN MACHINERY CO. LOGAN, W. VA.

Continuous production hangs on this shaft cable

Falling in unbroken, near-record drops of **one-third of a mile** each, two Okolite 5kv, strip-insulated shaft cables carry every bit of power down two separate shafts to Intermountain Chemical Company's vast trona mine in Westvaco, Wyoming . . . to operate diggers, loaders, conveyors, hoists, lights and blowers. Production, profits—and **lives**—depend on the absolute reliability of these cables.

"The cables are continually drenched by condensing moisture," says Jack Wilson, Intermountain's Maintenance Supervisor. Great length of the suspension puts tremendous vertical pressure on the cable components. Considering their importance as well as the tremendous job of replacing them, Intermountain naturally wanted the most reliable, longest-lived cable they could get. Those were two good reasons for choosing an Okolite-insulated construction.

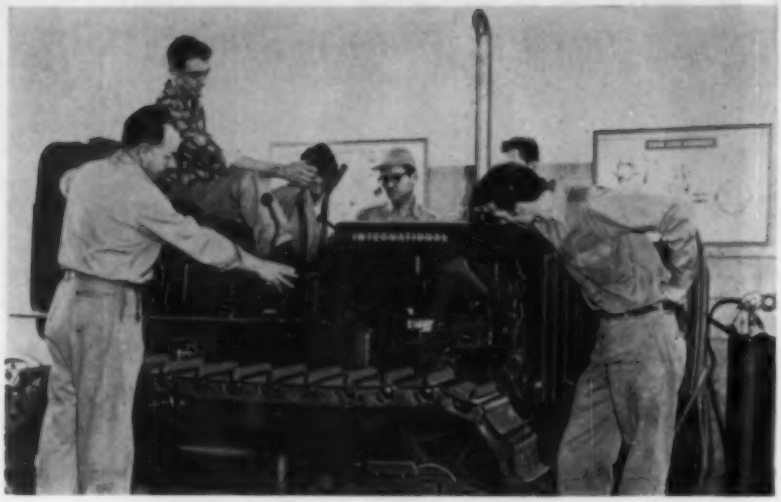
For **your** circuits that must not fail . . . be sure to call in Okonite. For information on choosing the right cables for your jobs . . . write for free Bulletin CA-1117, The Okonite Company, Passaic, New Jersey.

NEAR-RECORD CABLE DROPS

length: 1700 feet in each shaft
suspension: from a single clamp at shaft collar
construction: 3/c, 5kv, Okolite-insulated by strip process, with galvanized steel armor overall
weight: 19,000 lbs. each
tested: by 40,000 volts DC each
circuit and load: 4,160 volts from termination of Okolite-Okoprene aerial cables to power centers in mine

where there's electrical power . . . there's **OKONITE CABLE**

6217



New Mechanics School

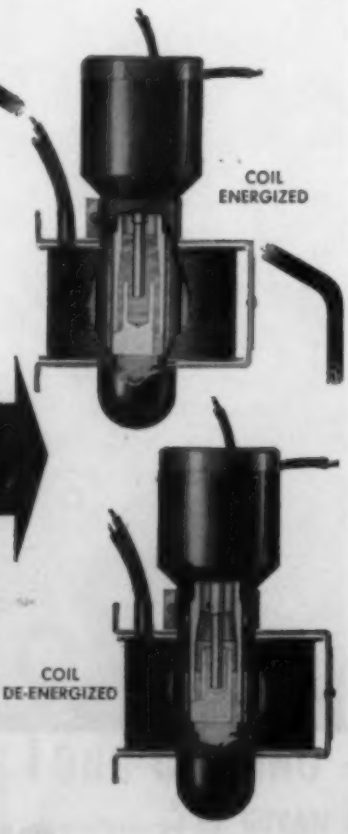
STUDENTS inspect a tractor at a Greer Institute technical school which has graduated over 1,000 men trained in the use, repair and maintenance of earthmoving equipment. The 56-yr old Greer Technical Institute, Braidwood, Ill., has announced it will open a new school in Wilmington, Ill., to train men as construction equipment mechanics. The 540-hr course will include 60 hr of instruction in: diesel engines, fuel injection systems, torque converters, final drives, steering systems, tractor tracks, cable controls, welding and bulldozer rebuilding. Heavy enrollment is expected from contractors and distributors representing various manufacturers of earthmoving equipment.

The TIMER RELAY that handles all controlled timing problems . . .

★ No false contacts
★ Non sticking
★ Practically "fail safe"
★ Low cost timer

Durakool
STEEL MERCURY TIMERS

This steel clad, factory set, tamper proof Durakool timer-relay is practically non-breakable. Operating life multiplied 5 to 6 times by new plunger construction features. Combinations of operate-release time delays from 0.15 sec. to 20 sec.—either normally open or normally closed action.



See telephone directory for local distributor, or write.
DURAKOOL, INC.
ELKHART, INDIANA, U.S.A.
700 WESTON RD., TORONTO 9, CANADA

Transportation (*Continued*)

The belt, which turns itself over after delivering a load, carries 800 tons an hour to barges on the Green River near Drakesboro, Ky. Because only the clean side of the belt runs on top of the return idlers, says Goodrich Rubber Co., the developer, clogging and damaging buildup of tacky materials on idlers or pulleys is eliminated.

Preparation Facilities

Jewell Ridge Coal Corp., Jewell Valley mine, Jewell Valley, Va.—Contract closed with Deister Concentrator Co., Inc., for six Concenco No. 77 diagonal deck washing tables with twin-decks to handle ¾x0 fraction.

Pocahontas Fuel Co., Div. of Consolidation Coal Co., Pocahontas, Va.—Contract closed with Deister Concentrator Co., Inc., for one Concenco No. 77 diagonal deck washing table with twin-decks to handle ¼x40 fraction.

Meetings

Twentieth Annual Mining Symposium, University of Minnesota Center for Continuation Study, coordinated with AIME meeting, Jan. 12, will be held at the Norshor Theatre, Duluth, Minn., Jan. 13-14. Instrumentation and Controls in Mining and Beneficiation is the theme.

Special Technical Conference of Mining Industry Committee, American Institute of Electrical Engineers, Fort Stanwix Hotel, Johnstown, Pa., Jan. 27. Afternoon session begins at 2:30 PM; dinner at 6:00; evening session at 7:30. Applications of AC power in mining and AC equipment developments are major themes.

New Books

Engineers' Handbook

Marks' Mechanical Engineers' Handbook, Sixth Edition, prepared by a staff of specialists and edited by Theodore Baumeister, has been completely revised and modernized. This well-known handbook is designed to give quick answers to many questions in every branch of mechanical engineering. The 18 sections of the handbook are the work of over 100 contributing experts. The fuels section takes the reader from the compost-

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Standard inclined screens . . . up to 5 inches. (Shown with air springs.)

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world's most complete line!

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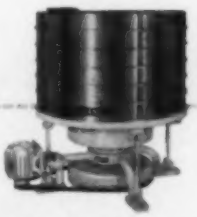
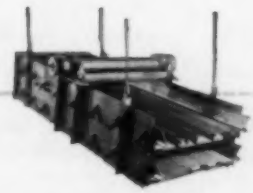
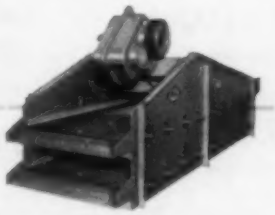


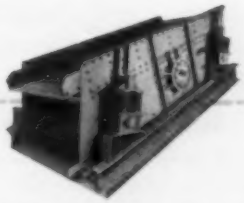
All-metal gyratory screens . . . 2 to 325 mesh.



Small inclined vibrating screens . . . 1½ inches to 40 mesh.



Horizontal vibrating screens . . . up to 2½ inches.



Heavy duty scalping screens . . . . up to 12 inches.

Expert application help. Allis-Chalmers not only offers the most complete line of dependable, high-production screens, but also provides expert counsel based on unequaled experience in screen applications. In addition, modern pilot plant facilities are available for test runs of difficult or untried materials, if necessary.

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- Suspended or floor mounted, or supported on air springs.
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- Wet or dry operation.
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- Dustproof enclosures.
- Electrical and mechanical anti-blinding devices.
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NEW DW20
Series G

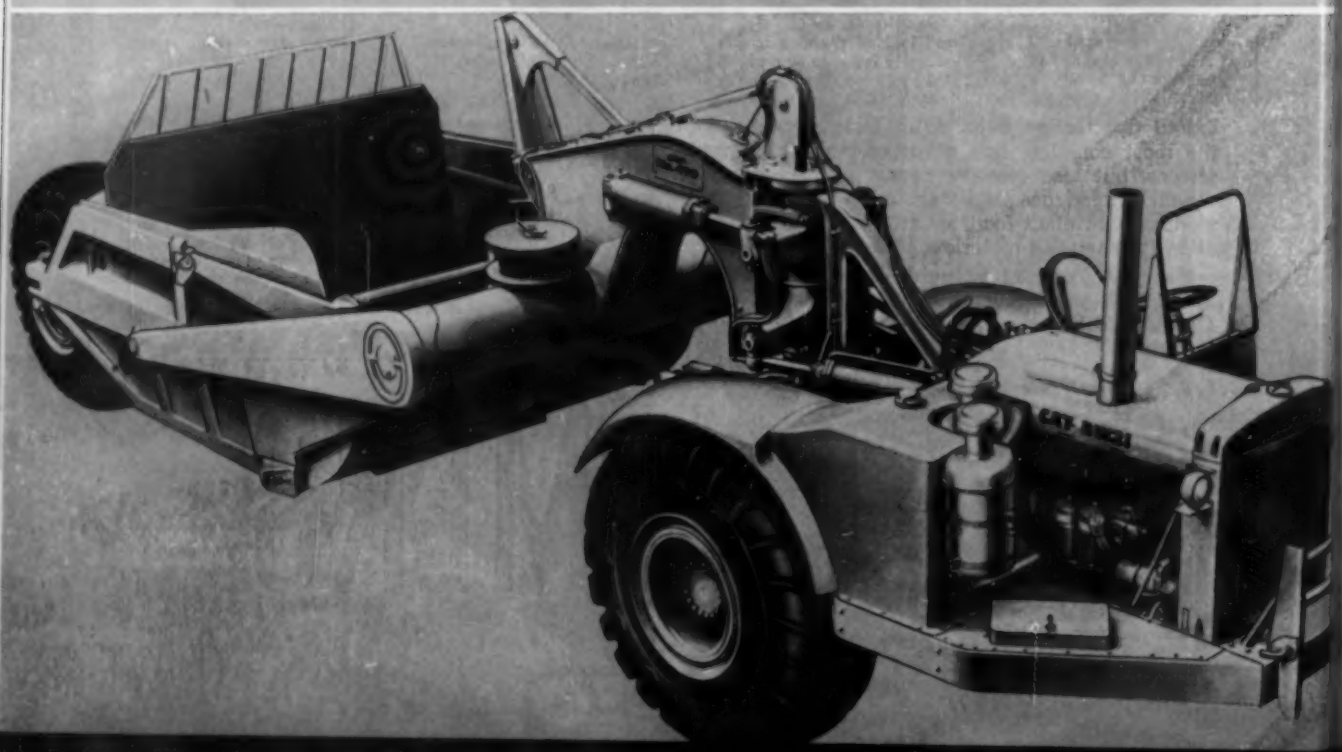
NEW No. 456
Series B

NEW HP —345 (maximum output)—increased 8%
NEW RIMPULL —39,565 lb. (maximum)—increased 12%
NEW SPEEDS —increased rimpull—provides up to 20% faster travel speeds under normal haul road conditions
NEW CAPACITY—19.5 cu. yd. (struck)—increased 8%
27 cu. yd. (heaped)—increased 8%

NEW DW21
Series G

NEW No. 470
Series B

NEW HP —345 (maximum output)—increased 8%
NEW RIMPULL —49,100 lb. (maximum)—increased 12%
NEW SPEEDS —increased rimpull—provides up to 20% faster travel speeds under normal haul road conditions
NEW CAPACITY—19.5 cu. yd. (struck)—increased 8%
27 cu. yd. (heaped)—increased 8%



CATERPILLAR'S PROJECT PAYDIRT

PROJECT PAYDIRT* *pays off for you*

NEW CAT DW20 and DW21 SERIES G TRACTORS NOW 345 HP

—plus new high-capacity LOWBOWL Scrapers for faster cycles and higher production!

For down-to-earth facts about these big new Caterpillar rigs, take a look at the box scores shown here. They summarize important increases in horsepower, rimpull, speeds, scraper ratings and tire capacities that pay off for you *on the job* with faster cycles, greater production and more profit!

Note that the increased HP of the DW20 and DW21 Series G, compared with the models they're replacing, gives 12% higher rimpull. This increased rimpull provides up to 20% faster travel speeds under similar haul road conditions. Equally important, this horsepower increase was achieved without any sacrifice whatsoever in the excellent torque characteristics inherent in the Cat Super-Turbo Engine. Torque rise of the engine in the Series G models is unequaled in the earthmoving industry.

In addition to the advantages featured in the box scores, the new Series G Tractors and their matching LOWBOWL Scrapers deliver the *proved* reliability of Caterpillar-built machines. To handle increased horsepower and increased capacity, both have been improved in design and structure. The tractors, for example, have stronger final drive gears and improved transmission shifter forks. The scrapers have stronger bowls, push frames, draft frames and aprons. All these and other improvements result in better service life, less maintenance and lower cost dirt.

Here are modern, heavy-duty wheel rigs geared to the needs of today's highly competitive market—rigs that meet your requirements for moving more dirt at lower cost than ever. Get the complete facts about them from your Caterpillar Dealer. Call him today and set a date for a demonstration!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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BORN OF RESEARCH
PROVED IN THE FIELD

TIRES: 29.5-29 (28-ply rating) are now standard in place of the former 29.5-29 (22-ply rating)—a tire capacity increase of 16% to match the increased scraper capacity, heavier machine weight and higher speeds made possible by more HP. Note: On the DW20 Series G, the front tires remain the same—14.00-24 (16-ply rating).

CATERPILLAR'S PROJECT PAYDIRT

***PROJECT PAYDIRT:** Caterpillar's multi-million-dollar research and development program—to meet the challenge of the greatest construction era in history with the highest production earthmoving machines ever developed.

STOP
material waste
REDUCE
handling costs
IMPROVE
product quality

with a
designed-to-
your-need
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storage system

Why put up with costly, inefficient coal storage and handling?

Let Marietta design and erect an efficient and economical storage system for your needs. Marietta concrete silos are quickly constructed without weather or material delays. Precast solid or lightweight air-cell concrete staves interlock to form an air-tight wall that keeps material stored fresh and dry . . . safe from weather or fire damage.

Marietta concrete silos provide years of service with minimum maintenance . . . save money through reduced insurance costs.

Any type of mechanical or pneumatic conveyors, feeders or discharge systems can be safely mounted on top or on the sidewalls of Marietta silos. Consult with Marietta now for the best answer to your particular storage problems . . . benefit by their more than 40 years "Know-how" in precast concrete and industrial storage systems.

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New Books *(Continued)*

tion and characteristics of various coals to petroleum and liquid fuels, gaseous fuels, explosives, dust explosions and rocket fuels. All sections, ranging from mathematics and mechanics of materials to thermodynamics, building construction and machine design are covered in detail. The handbook contains a wealth of engineering information in condensed, useful form and would be a valuable addition to the library of any engineer in the coal industry who deals with construction, design or combustion problems. *2320 pp. 6x9-in; leatherette. $23.25; textbook edition available at educational list price. McGraw-Hill Book Co., 327 W. 41st St., New York 36, N. Y.*

Coal Characteristics

Analyses of Tipple and Delivered Samples of Coal Collected During The Fiscal Year 1957, by S. J. Aresco, C. P. Haller and R. F. Abernathy. This report contains Bureau analyses of samples representing coal shipments to the government during the 1957 fiscal year. Analyses include coals from Alabama, Alaska, Arizona, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Missouri, Montana, New Mexico, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia and Wyoming. *40c, Superintendent of Documents, Government Printing Office, Washington 25, D. C.*

Electrical Design

Logical Design of Electrical Circuits, by R. A. Higonnet and R. A. Grea. This book explains Boolean algebraic methods for analyzing relay, diode and vacuum tube circuits, particularly as used in designing automation systems, computers, telephone dialing systems and similar applications. It is designed to be especially helpful to engineers who have had no special background in switching circuits. Pitfalls facing the engineer who is using relays for the first time, such as those relating to speed of operation and interference between units, are dealt with in detail. Many helpful examples, plus more than 300 illustrations are provided, *220 pp. 6¼ x 9¼-in; cloth; $10, McGraw-Hill Book Co., 327 W. 41st St., New York 36, N. Y.*

Equipment Approvals

Seven approvals were issued during November.

Goodman Mfg. Co.—Type 192-30 Ropex extensible belt conveyor; two motors, each 25 hp, 230-250 V, DC. Approval 2F-1407, Nov. 17.

Long Co.—Type MBC-1 mobile bridge carrier with Piggyback conveyor; two (or three) motors, one (or two) 5 hp and one 25 hp, 230 V, DC. Approval 2F-1408, Nov. 17.

Koehler Mfg. Co.—Model 282 Wheat electric cap lamp. Approval 6D-30, Nov. 19.

Joy Mfg. Co.—Type X736-62 conveyor belt drive unit; one motor, 40 hp, 250 V, DC. Approval 2F-1409, Nov. 21.

Joy Mfg. Co.—Type 15BU1-1AH loading machine; seven motors, six 15 hp and one 4 hp, 440 V, AC. Approval 2F-1410A, Nov. 24.

Jeffrey Mfg. Co.—Type MT-66 shuttle car; three motors, each 10 hp, 500 V, DC. Approval 2F-1411A, Nov. 24.

Goodman Mfg. Co.—Type 192-36 Ropex extensible belt conveyor; two motors, one 25 hp and one 50 hp, 230-250 V, DC. Approval 2F-1412, Nov. 24.

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EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE

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Skilled crews and complete stock of core drills and accessory equipment maintained at all times

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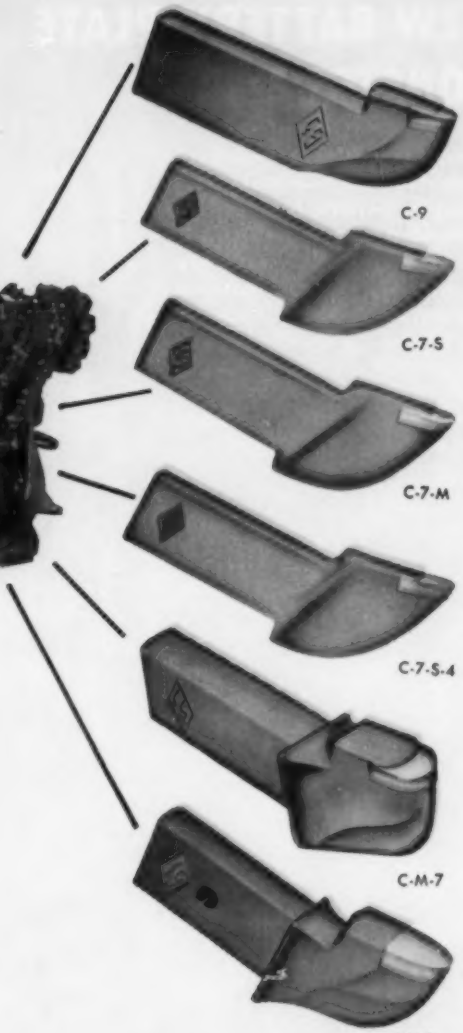

Wide Tool Selection for use on...

JOY
CONTINUOUS MINERS
for every mining condition

This powerful behemoth of the coal mines, and other mammoth counterparts, depends upon its "teeth" of *Firthite carbide inserts* for fast, dependable, economical mining.

The FIRTHITE Blue-Bit line provides a full complement of cutting tools for each position on the cutting chains and pineapples and for every type of cutting condition. Recommended tools are tabulated at the right, each one designed to do the best possible cutting job at the lowest possible cost.

A Firth Sterling mining tool engineer will be glad to discuss your problems.

YOUR AUTHORIZED FIRTH STERLING MINING DISTRIBUTORS HAVE COMPLETE STOCKS FOR IMMEDIATE DELIVERY.

RECOMMENDED TOOL NUMBER*		Cutting Conditions	Coal	Holder
CHAIN	PINEAPPLE			
C-9	C-7-S	LIGHT TO MEDIUM	Relatively Clean	½" x 1"
C-7-S C-7-M	C-7-S C-7-M	MEDIUM TO HEAVY	Occasional Impurities	½" x 1"
C-7-S-4 C-7-M C-M-7	C-M-7 CMC	HEAVY	Large Quantities Clay Sulphur Rock, etc.	½" x 1"

*FS style CMD available for Drum (Roller) Type Machines

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NEW BATTERY PLATE CONSTRUCTION

Unique new double-sleeve, multi-tube positive plate construction permits greater volume of active material per tube and greater accessibility of electrolyte to the material — providing greater capacity for brighter, better light with no increase in plate size. Long battery life with increased resistance to vibration and hard use are plus advantages.

NOW

A PERFECT SPOT at your fingertips — either filament!

A finger-turn of the switch knob lights either filament of the powerful equal-filament bulb—and at the same time achieves a perfect, brilliant spot! No tools, no fuss or tinkering. Anyone who can turn a switch can focus an ideal spot with WHEAT—instantly!

a MAJOR ADVANCE

in better light for the miner!

THE WHEAT National MODEL

MINER'S ELECTRIC CAP LAMP

In a single step, WHEAT moves out front in better light, greater utility, top service for the worker underground! The WHEAT *National* Electric Cap Lamp incorporates advances in battery, bulb and focussing beyond comparison in the field today—retains every factor of dependability, simplicity and ease of maintenance that have made WHEAT the leader in sales increase for the past decade. See your National Mine man now, and talk WHEAT NATIONAL for its very good reasons!

30% MORE LIGHT

at no increase in weight

Advanced, exclusive new battery construction joins with efficient new krypton-filled bulb to achieve unrivalled light output in a miner's electric cap lamp today . . . 30% more light than even the high-powered Wheat Forty-niner! For the *most* light for the miner throughout the working shift, specify WHEAT NATIONAL.

TWO WORKING FILAMENTS

in Krypton gas-filled bulb

Each of the two identical filaments in the new Wheat krypton-filled bulb is a full-power working filament. If one burns out, the other is instantly available at equal high brightness—and is focussed instantly to an equal perfect spot. Only WHEAT NATIONAL offers this operating ease!

National Mine Service Company

Koppers Building Pittsburgh 19, Pa.

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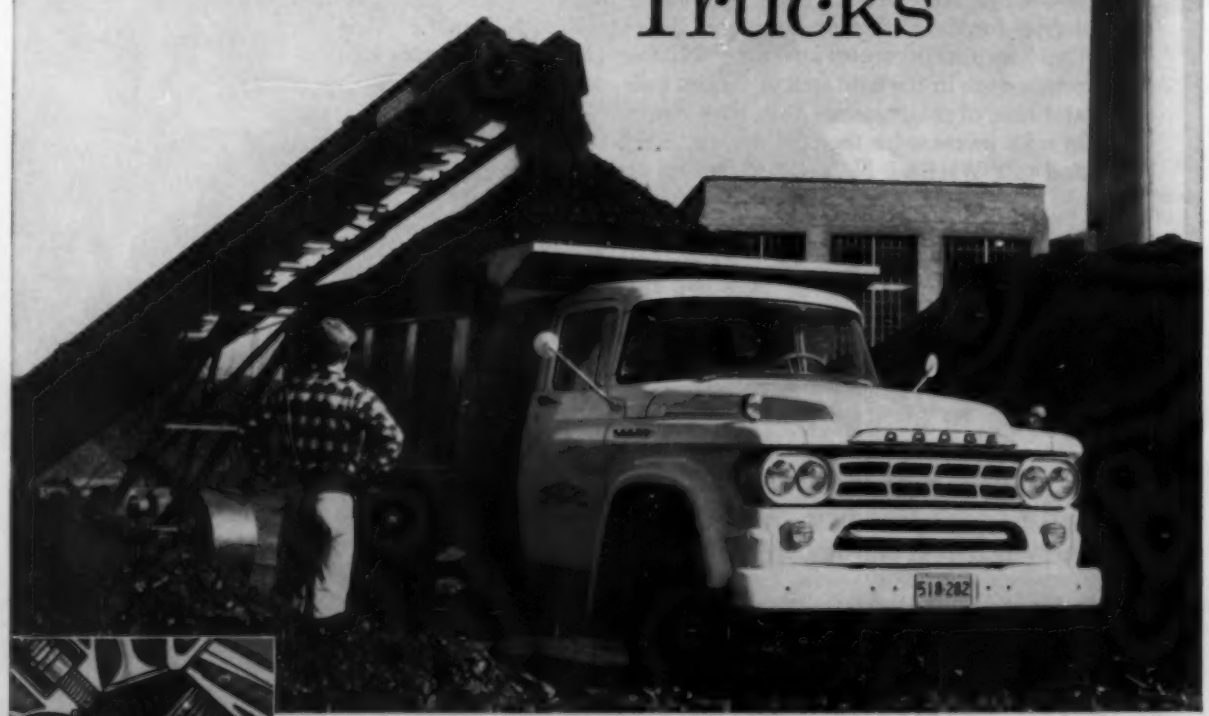
IN CANADA: NATIONAL MINE SERVICE (CANADA) LIMITED Elliot Lake, Ontario

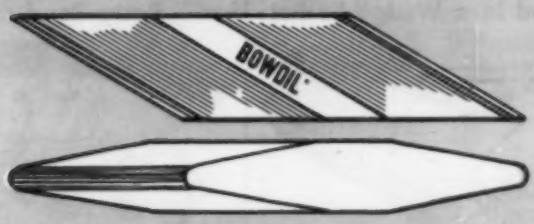
Hauls a lot for a little ! This Dodge D500 has a big appetite for work—a small appetite for gasoline. And see how this thrifty, versatile worker can be matched to your *specific* job: Choice of four engines, from 125 to 210 hp. . . . 4- or 5-speed synchromesh transmission, or 6-speed Torqmatic . . . 3 front spring capacities, up to 2,200 lbs. . . . 3 rear spring capacities, up to 8,000 lbs. . . . single or 2-speed axle.

Your Dodge dealer will be glad to show you how this wide choice of components gives you a truck that is "Job-Rated" for your specific job. He'll also show you the driver-adjustable hand brake, hydraulically actuated clutch, electric windshield wipers, and all the other quality truck features that are yours *at no extra cost* with Dodge. See him soon—discover why . . .

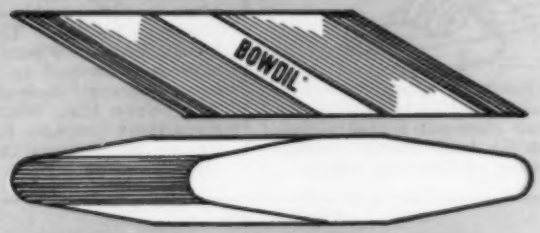
today,
it's real smart
to choose Dodge
Trucks



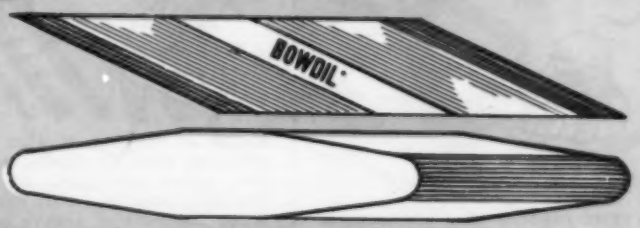
Dome-shaped combustion chambers like this deliver maximum power on low-cost regular gas. They help prevent harmful carbon deposits, too, cutting down the need for overhauls. And, of course, these technically advanced V-8 truck engines have famous Dodge dependability through and through, for years of economical service.



Series 1-1 — **REGULAR DIAMOND BIT, designed for use where cutting conditions are not too severe. Saves power, produces coarse cuttings. 1-1 is MEDIUM Temper, 1-1N1 TOUGH, 1-1N2 HARD.**



Series 1-2 — **HEAVY DIAMOND BIT is especially designed for severe cutting conditions (Iron Pyrites and Rock). 1-2 is MEDIUM Temper, 1-2N1 TOUGH, 1-2N2 HARD.**

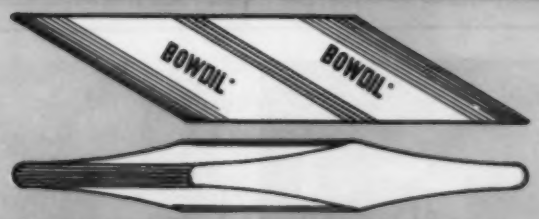


Series 1-6 — **LONGWALL BIT is especially designed with a long cutting point for Longwall work. 1-6 is MEDIUM Temper, 1-6N1 TOUGH, 1-6N2 HARD.**

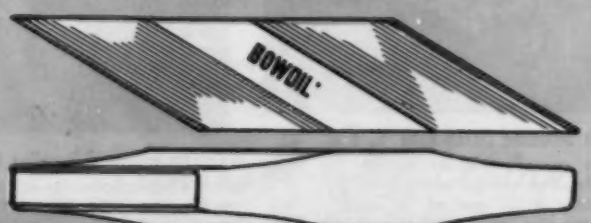
There's a BOWDIL® Bit for every cutting need!

These various types are designed for specific requirements, are made from special alloy steels and are heat treated to three different tempers as listed. Through many years of research on actual conditions in the field, these styles, shapes and hardnesses of Bowdil Bits consistently prove the most popular. We are happy to offer our experience and recommendation for your individual need.

TO HELP YOU RE-ORDER, PLACE YOUR TYPE BIT ON THESE ACTUAL SIZE DRAWINGS



Series 1-11 — **REGULAR CONCAVE BIT is designed for the maximum in power savings. Due to the concave shape, side clearance is automatically maintained as the face is worn away, resulting in a more uniform power consumption over the full life of the bit. No. 1-11 is MEDIUM Temper, 1-11N1 TOUGH, 1-11N2 HARD.**



Series 1-29 — **HEAVY DUTY CONCAVE BIT has the design features and similar cutting advantages of the Regular Concave, but is made heavier for very severe service. No. 1-29 is MEDIUM Temper, 1-29N1 TOUGH, 1-29N2 HARD.**

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THE BOWDIL CO., CANTON, OHIO

Gentlemen: Rush us

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(Quantity)

Name ----------

Address ----------

City ---------- State ----------

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Tuffy® Wire Rope Tips

Guard Against These Killers!

. . . Get The Full Measure of Service-Life Built In By Wire Rope Specialists

Mangled in a Wedge Socket

Here's a result of improper socketing. It was caused by using a poorly designed or worn-out wedge socket. Failure at the dead end can damage other sections of the rope, too.

Rusty Road to Ruin

Rust—No. 1 enemy of steel—takes a heavy toll in wire rope life. An insidious, silent type of killer, rust often does irreparable damage before it's even noticed. The one-strand break shown here resulted when the rope was allowed to become rust-bound through lack of lubrication. Tests show that, with other conditions ideal, properly lubricated rope has up to 10 times the life expectancy of dry rope.

Tuffy Balanced Scraper Rope

"Balanced" construction makes it flexible enough to withstand sharp bends, yet stiff enough to resist looping and kinking when slack. Also gives higher resistance to the shock of load impact on slack line. Moves more yardage per foot because it's specially built to take the beating of drum-crushing abuse.

Overloaded — Soon Exploded

The rated capacity of a wire rope is based on the breaking strength (catalog) divided by a safety factor applicable to the type of service or use. The grade of steel, type of construction and size of the rope determine tensile strength. It must be properly related to the loads it will carry, or costly and dangerous early failures are likely to occur.

Victim of the Bends

Excessive bending of wire rope accelerates wear. Generally, more flexible ropes are used as bending stresses increase (with decrease in tread diameter of sheave or drum). If a rope is operated on a sheave too small for its bending characteristics, early failure is certain. Through an exhaustive series of bending tests, Union Wire Rope engineers have compiled data that you can use to assure getting the rope construction that will give you the longest service life. Ask about it.

Tuffy Balanced Slings & Hoist Lines

"Balanced" because they combine strength, flexibility and toughness in the proper relationship to do a better job longer.

Tuffy Slings and Hoist Lines are a top-performing team in every type of materials handling. The slings are made of a patented, machine-braided fabric that's next to impossible to knot or kink. The hoist lines are a special construction in which strength, flexibility and toughness are balanced.

Tuffy Balanced Dozer Rope

Built to give you longer service with less downtime. Mounted on your dozer, a 150' reel of ½" or 9/16" can give you a big bonus of extra service. Here's how: when rope shows drum wear or is crushed on the drum, you feed through just enough to replace the damaged part. You save the 40 to 50 feet ordinarily thrown away. Also available in 300' and 500' reels.

Tuffy Balanced Dragline Rope

Here's highest abrasive resistance with super flexibility. Better spooling. Smoother riding on grooves. And Tuffy Dragline Rope hugs the drum when casting for full load. Gives you longer service life, consistent dependability, in handling any material — wet or dry dirt, sand, gravel, rock, cement or minerals.

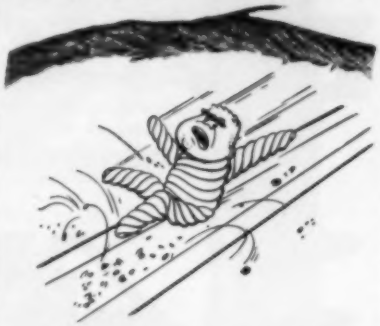
Crushed by a Tractor Cleat

The Sunday punch for this piece of wire rope was delivered by a tractor cleat—just one of many crushing injuries caused by rope being run over or banged into by hard, sharp objects. Even the toughest wire rope is no match for this kind of mistreatment.

After a Suicide Jump

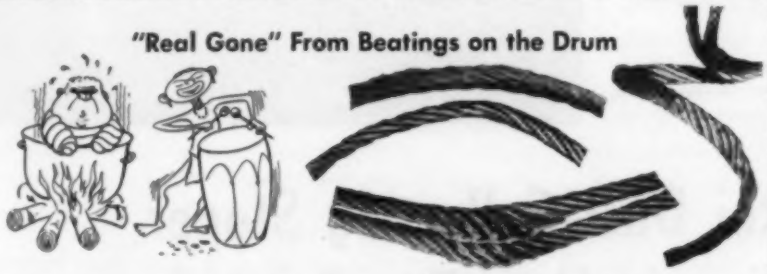
This rope jumped out of sheave and was soon destroyed by pulling around the shaft. Actually it was a case of sudden slack which threw the rope out of the sheave.

Burned on a Frozen Sheave



End of the line came quickly for this rope as the result of operating over a sheave that did not turn. Note the exceptionally heavy abrasion on one side of the rope. Sheaves should be checked thoroughly and often.

"Real Gone" From Beatings on the Drum



Even under normal operating conditions, drum wear gives wire rope severe punishment. This wear concentrates at the cross-over points and at the flange. Excessive drum crushing results from operating on small drums, excessive loading and poor winding. Smooth drums are not recommended. Here are typical "drum beatings": Cross-over wear; cross-over crushing on drum; drum crushing from poor winding; drum-crushing from small drum.

Although drum wear cannot be eliminated, its effects can be greatly reduced. Under properly engineered procedures, two and three times the service can be obtained from the same line by improving drum conditions. Union Wire Rope Engineers will help you with this problem. Get in touch with us for information.

On the "Blink" from a Kink

This open kink resulted from mishandling of rope. Guard against kinks by proper winding on the drum. Never pull a loop smaller. Always enlarge it, then straighten out the rope.

Strangled by a Misfit Sheave

When the bearing surface of a sheave is too small for the rope diameter, pinching action quickly destroys the rope — especially when it's overloaded. The victim shown here was knocked out in just 1½ hours of service.

Tuffy Wire Ropes are "Job Prescribed"—Each Designed for a Particular Type of Machine

There are thousands of wire rope constructions and Union Wire Rope specialists make them all. But, there is only one Tuffy line of wire ropes. Each Tuffy was developed and proved the one best rope for the particular work for which it is intended. It is designed as a functional part of the type of machine on which it is used.

Tuffy Wire Ropes are "job prescribed" and balanced in each prescription are all the ingredients of strength, flexibility and toughness to give you genuine relief from inefficient operation, foreshortened service life and safety hazards. You get longer service life and you cut down on your rope costs. Union Wire Rope Corporation, 2130 Manchester Avenue, Kansas City 26, Missouri.

Your Tuffy Distributor Can Help You Get The Full Measure of Service Life

C1

UNION Wire Rope

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products

Steel changes for the S-12V stopers are 24, 30, and 36 inches long. Overall stoper heights are 37, 43, and 49 inches.

Large openings and high vacuum make the Vac-Nu-Matic dust box equally efficient at removing dry or wet cuttings.

Right: The new S-12V Vac-Nu-Matic fills the need for a heavier dust-collecting stoper to speed up roof-bolting operations which are so essential to continuous coal mining.

New Le Roi Dust-Collecting Stoper Speeds Drilling in Hard Top Formations

S-12V stoper features popular Vac-Nu-Matic® dust collection system.

Enables miners to increase drilling footage with less effort.

The new Le Roi S-12V Vac-Nu-Matic stoper combines greater heft, more power, and positive "through-the-drill-steel" dust collection — for faster, dustless drilling of roof-bolt holes in hard top formations.

Its powerful piston impact, free-cutting bits, and powerful rotation assure faster penetration—eliminate stuck steel. The stoper's heavier construction is balanced for easy handling—enables the operator to work more efficiently and in greater safety.

Le Roi's Vac-Nu-Matic dust-collection system is an integral part of the stoper. Since no additional equipment is needed, the S-12V reduces set-up time and can be moved easily to any part of the mine.

Positive Dust Collection

All system components are specially designed to assure positive dust collection throughout the entire drilling cycle. This integrated design keeps dust count in the drilling area well below the approved Bureau of Mines standards.

What's more, the S-12V can be used with two types of bits to cope with changing seam structures. The Vac-Nu-Matic bit is best suited for soft formations, while the 5-hole CRD bit is recommended for medium to extremely hard top structures.

A touch of the operator's finger-tip provides finely graduated feed-pressure control to meet varying requirements. Constant blowing at the chuck keeps cuttings out of drilling mechanism, assuring long, trouble-free service. Other features include socket-type sliding chuck, end-seating automatic valve, positive pressure in both directions, and short stroke.

Feeds and Weights

The new S-12V stopers are available with 28-, 34-, and 40-inch feed legs, and weigh 105, 110, and 115 lbs. respectively. All are adaptable for hand-held operation or jumbo mounting.

Write today for information on the new stopers. Also ask about the new dust-collecting conversion kits that Le Roi offers to change older S-11 and S-12 stopers to cost-saving Vac-Nu-Matic dust collection.

"Vac-Nu-Matic" is the registered trademark for Le Roi's dust collecting stopers, bits, and dust boxes.

WABCO

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Newmatic air tools, portable and Tractair® air compressors, stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

COAL AGE

JANUARY, 1959

IVAN A. GIVEN, EDITOR

Electric Coal

GOOD NEWS is particularly welcome at the beginning of a new year—and especially at the start of 1959 with the effects of the depression still lingering, oil still tough, and natural gas, with an assist from Canada, getting set for a stepped-up drive. The good news is that electric coal for home heating—and cooling—has reached the snowballing stage, meaning in turn a major increase in electric-power generation in the years to come.

Most significant is the fact that this means that coal, since it is the premier power-plant fuel, is staging a re-entry into the home-heating field. Even more significant, this means that where electric coal goes in, oil and gas are out or, equally important, cannot get in. This results from the fact that conveniences and cleanliness are the tests in the big majority of home-heating installations, and there is nothing more convenient and cleaner than electricity. An added selling point is the fact that an electric-heating setup leads naturally into a cooling setup for summer—and vice versa. And if an appreciable number of home owners could be apprised of the benefits and low cost of snow-melting cables in their driveways, the potential would be raised another considerable notch.

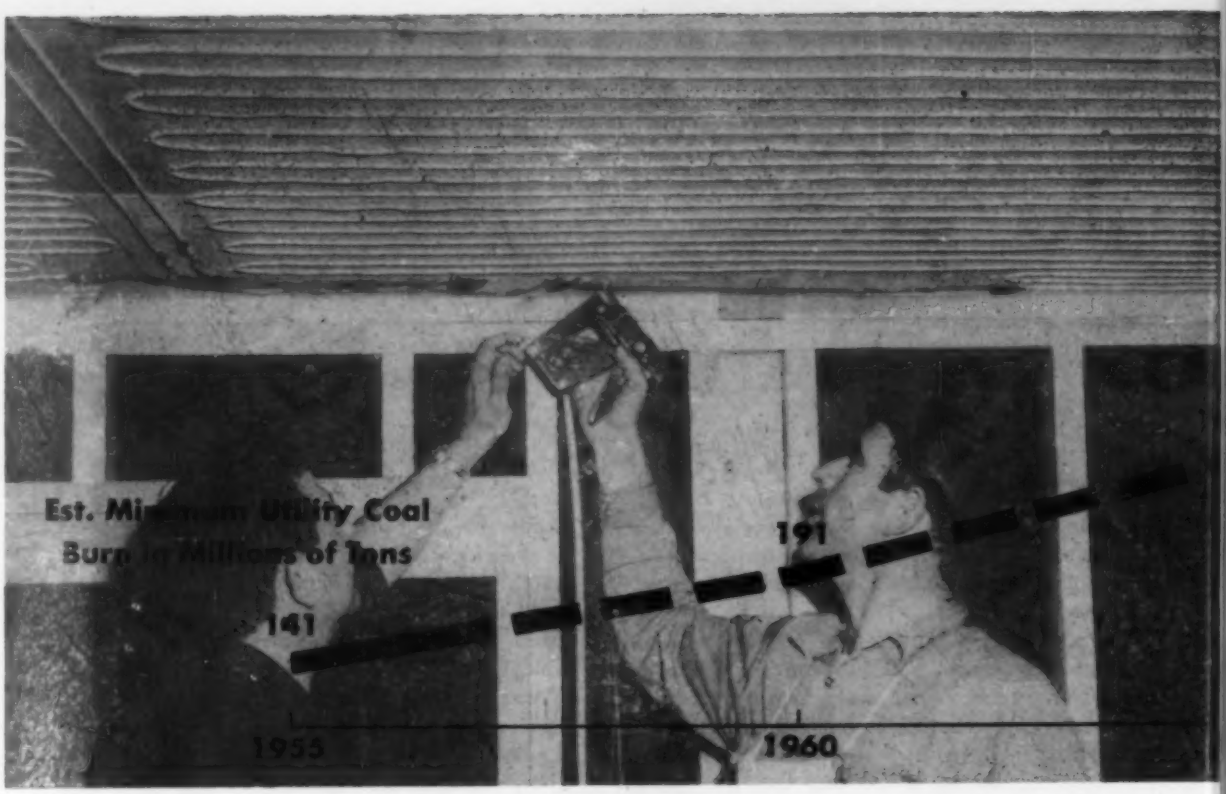
At first glance, of course, the news may not seem good to those who still receive considerable revenue from domestic sizes. At second glance, however, the conclusion is that if further losses are incurred they would be experienced anyhow as a result of established oil and gas competition. If the replacement was electricity, or if electricity got the business in the new establishment, coal would still have the business even though in a different size or quality or both. On balance, as shown in the special report on progress and possibilities starting on the next page of this issue, the net gain from electric heating is clear and major. The faster it can be made to grow the sooner coal can cash in on the added tonnage—in addition to throwing the most-effective of blocks at oil and natural gas in the home-comfort field, plus a lot of the commercial and small-industrial field.

Computers Too

AS COAL MOVES more and more toward mechanized automatic mining and preparation, and as costs for the equipment and facilities, and for the necessary manpower, continue to rise, it finds itself turning more and more to new approaches and techniques necessary to insure the expected returns from the investments. Thus, coal first called on industrial engineering, then turned to operations research, and now is studying the application of linear programming as another of the possible steps to greater efficiency.

Suppose the job is to work out a set of specifications for blending half a dozen or more coals, part produced and part purchased and all subject the usual variations, to achieve final shipments with qualities varying in accordance with application or purchaser requirements. Linear programming, involving punched cards and a computer—rented or borrowed—provides the answers at low cost and, perhaps equally important, in a minimum of time.

As has been said on a number of occasions, coal mining isn't what it used to be. It's better—because of new machines and new techniques, including linear programming.



ELECTRIC UTILITIES have decided to push resistance heat and the heat pump as keys to boosting utility coal-burn to a predicted '75 minimum of 467 million tons. Satisfied

New Growth Patterns for Coal . . .

By W. A. Raleigh Jr.
Associate Editor, *Coal Age*

LOOK FOR accelerated growth in electric space heating for these principal reasons:

1. Consumer acceptance is no longer confined to TVA and warm-weather regions.

2. Market growth is no longer impeded seriously by cost considerations and an inadequate line of equipment.

3. Sales promotion is no longer hampered by apathy within the ranks of most investor-owned, "straight-electric" companies.

Utility executives and authorities close to the picture are predicting this order of growth for electric space heating:

The number of homes and buildings completely heated by electric resistance heat will move up from an estimated 321,000 in 1958 to 1,000,000 in 1960 and 3,000,000 in 1965. Heat-pump units installed should increase from an estimated 37,000 in 1958 to 75,000 in 1960 and 210,000 in 1965.

Beyond 1965, industry predictions are generally less firm. Note, however, that the heavily coal-burning American Electric Power System expects the tally of heating customers for its eight member companies to jump from 12,000 in 1958 to 500,000 in 1975.

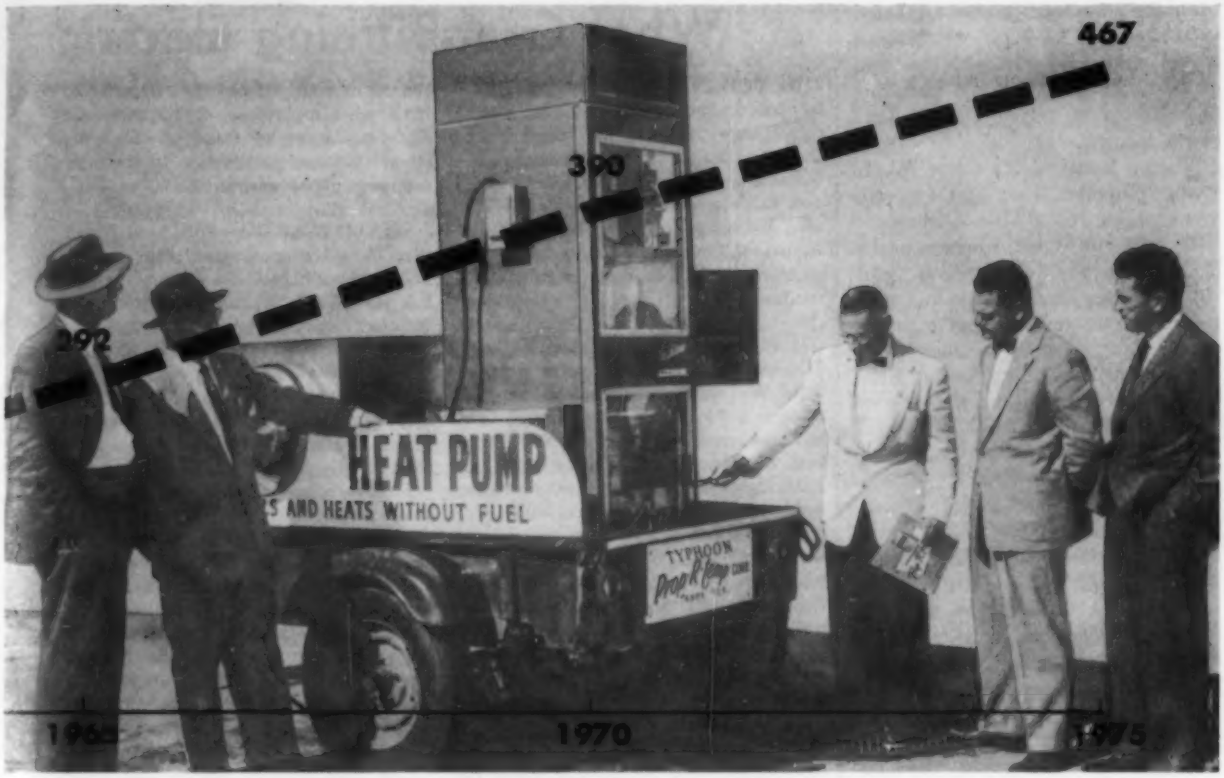
Accelerated growth in electric space heating has great significance to coal because:

1. It may well be a major factor in boosting utility tonnage demands by 1975 to predicted levels ranging upward from 467 million tons (*Coal Age*, February, 1958, p 84).

2. It could also be the coal industry's best hope for recapturing big losses in retail sales during the past 15 yr, and for preventing further conversions to gas and oil where cost advantages alone are not enough to sell direct use of coal with modern coal-burning equipment.

Coal's two-pronged stake in electric space heating suggests the need for a closer, more active tie-in with utility-promotion programs. And if coal management has been waiting for the electric-utility industry to make up its mind about the big push, the clue came last June in a space heating and heat pump conference held jointly in New York by *Electrical World*, a McGraw-Hill publication, NEMA's Electric House Heating Equipment Section, and selected heat-pump manufacturers.

Summing up the results of the meeting—the third of a series which has become the sounding board for



growth in residential and commercial kwhr sales. Their success will be a major factor in customers already number in the hundred of thousands.

Electric Heat Comes of Age

the industry's attitude toward space heating—*Electrical World* states:

"Judging from the intensity of interest, [this attitude] has changed since the muted hostility of the first conference (1950) and the mixture of enthusiasm and raised-eyebrow skepticism of the second (1956)." Now there is apparent agreement on the two principal points emerging from conference sessions:

"Electric heating—the keystone of the all-electric home—is the only way the electric utilities will ever break the 'kilowatt-hour barrier' they are now facing and go on to the higher consumption levels about which they have been talking for years.

"It is one of their best hopes in solving the increasingly complex problems that run the gamut from peaks to revenues, from distribution to housepower."

A large part of the drive to accelerate the growth of electric space heating naturally comes from utilities in the South and Far West which are already fairly well-rooted to the market. Added impetus, however, is coming from utilities, mostly straight-electrics, in the industrial Northeast and Midwest which have heretofore been apathetic to promotion.

More push also is coming from allied quarters having a close interest, including equipment manufacturers, building contractors and architects, and engineering and market consultants. Coal's interest has yet to manifest itself in industry-wide proportions, although a series of articles in the UMWA Journal and at least two industry meetings have featured discussions on the subject this year.

From all these groups, *Coal Age* has synthesized the following fact-and-opinion roundup which underscores the real prospect of a major shift in the use of energy to supply the Nation's space heating load.

Space Heating: Key To Future Growth

In electric space heating, most utilities see the key to achieving maximum future growth in total sales. The achievement must be based on a distribution pattern which affords simultaneous opportunities for both building and balancing load. Electric space heating holds the logical answer to offsetting the trend to higher summer peaks caused by air conditioning. It also has no peer as a wedge to the all-electric home and increased per capita consumption.

The Shifting Peak Situation—While there are regional variations in the rate of growth, all eight power-supply regions in the U. S. have registered upward summer-peak movements. On a nationwide basis summer peaks (expressed as percentages of following December peaks) have risen

from 93% in 1955 to an estimated 97% in 1958. By 1960 the national ratio should reach 99% with increases expected in most regions, including the Northeast, East Central and North Central.

Ebasco Services' Executive W. L. Byrne pinpoints load factor trends and explains why utilities must reckon with shifts to higher summer peaks:

"In areas where the winter peak still is greater than the summer peak the trend is toward the point of equilibrium; that is, summer peaks are approaching winter peaks. Here, load factor is increasing. But as soon as the summer peak exceeds the winter peak, load factors begin to tumble.

"Throughout the country summer peaks are continuing their steady climb in relation to winter peaks. Back in 1952 the southwest had a summer peak 15% higher than the following December. Last year the difference rose to 32 percentage points. In the same period, load factor declined from about 62% to 56.4%—5.6 percentage points lower.

"Even in New England, the summer load is rapidly overtaking the winter peak. On a regional basis, summer peaks were 88%, 92% and 97% of the following December peaks for the years 1955, 1956 and 1957 respectively. In those same years, load factor improved from 57.2% to 60.8%. Translated into return on investment, these figures have real meaning.

"But northern utilities are not being lulled into complacency, for they know what happened in the South and Southwest can hit them too—with much more impact . . . It takes just as large a cooling unit for the few hot days in the North as it does in the South. And, of course, with the limited hours of use in the northern climes load factors will tumble faster than ever, unless offsetting winter load is added. This is where space heating comes in, for it is completely complementary to the cooling load. And several northern companies are already aggressively promoting electric heat with this in mind."

The Key to the All-Electric Home—The all-electric home has long been considered the ideal means to maximum gains in residential use of electricity. Now, more and more utilities are recognizing that the central

What Coal-Burning Electric

THE DRIVE FOR ELECTRIC HEAT by coal-burning utilities has special significance to coal. For this reason, *Coal Age* asked two AEP companies—Indiana & Michigan and Ohio Power—and three others—Commonwealth Edison, Indianapolis Power & Light, and Alabama Power—for a rundown of their experience to date. Highlights of replies follow:

INDIANA & MICHIGAN ELECTRIC CO.—Among the reasons why we entered the home heating market was the rapidly growing air conditioning load and the desire to compensate for it with a balancing winter load.

Another factor was that customer acceptance of living electrically had been built to a point in our case where it seemed only natural for the customer to think in terms of heating electrically. At the time, we had about 60% range saturation and 40% water heater saturation. A number of customers had installed electric heating with great satisfaction prior to our entering the market.

Thus, the heating market was fast developing into the pivotal force in determining whether a home would use gas or electricity for cooking, water heating, and clothes drying. And, in today's competitive situation, it is becoming increasingly important to capture the heating market in order to secure the domestic appliance load.

During past years our company has added between 4,000 and 7,000 new customers annually. These come almost exclusively from new home construction.

To realize the greatest benefit from the potential of the domestic market, it is necessary to promote to the fullest the concept of the all electric home—Live Better Electrically. This includes, of necessity, space heating.

At the present time, resistance heating units are accounting for the majority of the domestic installations. In 1957, 1,015 residential resistance-type homes were added to our lines as compared with 60 heat pumps. The heat pump has the lead in the commercial market because of universal insistence upon air conditioning in this area.

Cost-wise, our experience has been favorable. In the September issue of *I&M News*, for example, we featured a story of one home where it cost a little over $20 a year more to heat electrically after insulation. We have other cases of similar experience.

In spite of favorable cost experience, we do not emphasize the comparative cost with customers. We feel that electric heating has enough advantages to justify its cost without the necessity of involved comparisons. Our experience has largely borne this out. And we stress customer satisfaction in many of our newspaper ads.

OHIO POWER CO.—Following World War II, we were making plans to develop domestic load. In these plans, the full use of our service was uppermost in our minds. We realized that the domestic load market would have to cover much more than merely the use of an electric range, water heater, refrigerator, lighting and small appliances if each home were to be considered all electric.

Following our studies we also saw that, if gas companies continued the great progress they had made in home space heating, they would eventually gain more strength in competing with us for cooking, water heating and the then new clothes dryer market. To meet this competition in the kitchen and laundry, we decided to promote electric space heating, insisting on proper insulation, storm windows and doors.

The thousands of homes that were built in our service area provided a tremendous market for residential load growth. And with the greater acceptance of summer cooling in the future homes, we could look toward a much better balance between our summer and winter loads if we promoted electric space heating.

Today, space heating is our only hope to attain the residential kwhr-use that we are after, so we are not only working on every new home but are also spending a great deal of time in selling the existing gas user to convert to electric heat.

Our greatest need for increasing the sale of electric space heating is more live wire dealers. Increased national advertising will also help. Public acceptance is increasing daily but we need more publicity regarding this acceptance to help hasten the program.

At the end of August, we had 3,168 homes using resistance heating and 168 residential heat pump customers.

The average overall cost of electric service to these customers is $315. Of this, from $160 to $180 a year covers their cost of heating. This, of course, varies according to the size of the house and the temperatures they keep in each of the rooms. It is difficult to draw a comparison between this and other types of heating due to the difference in the insulation. Our experience with the customers we have using electric heating, however, is that they have no complaints on operating costs.

Utilities Are Saying . . .

COMMONWEALTH EDISON CO.—Electric heating is important to our business because it represents the biggest potential use of electricity for our residential customers who number nearly 1,750,000. An electrically heated home will use upwards of 20,000 kwhr a year for all purposes. This is over seven times our present average annual residential use of 2,700 kwhr.

Traditionally we have been a "winter peak" company . . . Lately, we have changed to a "summer peak" company with our highest load coming the middle of the summer when the air conditioners were all working. Our forecasts indicate that this summer peak condition will continue for some years. As a result, we will have kilowatts available in the winter which can be sold at a concessional price. That's why the company now offers electric heating at 1½ c per kwhr rate.

At the end of 1956, before the company began promoting electric heat, there were about 80 residential installations on the lines. By the end of 1957 the number had increased to 142. On Sept. 1, 1958 there were 916 jobs either completed or under construction.

No similarly accurate count has been kept of commercial installations but there is a corresponding growth of interest in electric heating for factory offices, motels and shopping centers.

To develop the electric heating market as rapidly as possible, the company has worked out a balanced program designed to cover every segment of the market. The program includes the following:

For the architect, a design consulting service . . .

For the builder, advisory and sales promotion services . . .

For the project builder, as part of our underground distribution package, under certain conditions, up to $100 per house on the cost of customer service connections . . .

For the electrical contractor, a series of six-session courses in electric heating . . .

For equipment distributors, special meetings to facilitate cooperation in delivery, installation and service . . .

For lending institutions, personal calls to expedite approval of mortgage financing . . .

For manufacturers, participation in experimental installations . . .

For the public, extensive advertising and publicity programs.

INDIANAPOLIS POWER & LIGHT CO.—There are three basic reasons why we decided to promote electric heating:

1. It was determined, after a thorough study, that electric space heating was a highly desirable and profitable load in our area.

2. With the rapid growth of air conditioning use, it was imperative to establish promotion on a winter load to maintain a proper level of annual load factor.

3. From a competitive standpoint, if we are to gain an increasing share of the appliance load in the new home market, it is necessary to have a complete electric package to promote. Competitive practices of the gas industry in many areas requires two major gas appliances to qualify for gas for space heating. To combat this, it is necessary to create a desire for electric heating, so as to insure a market for appliances.

In the spring of 1957, after several years of market research and careful testing, IP&L undertook a massive advertising and promotion campaign. Since then hundreds of homes, shops, stores and offices have installed electric heating and cooling.

As of Aug. 31, 1958, the company had 675 dwellings completely heated by electric resistance equipment, and 34 by all-electric heat pumps—for a total of 709 residences heated electrically . . .

In the commercial field, where the electric heat pump is finding rather rapid acceptance, the company now has 134 heat pumps installed in 46 different establishements. These establishments represent 24 different types of commercial enterprise. Included are 4 branch banks, 4 insurance offices, 3 supermarkets, 3 drugstores, 2 union headquarters, and 2 mortuaries—indicating the variety of applications . . .

By the end of 1958, it is anticipated that the company will have about 1,000 electrically heated residences, and about 175 heat pumps in service in the commercial field. The residential figure is predicated on the fact that 24 builders in the company's service area now have all-electric subdivisions underway.

On the matter of installed costs, experience is showing that the combined package of electric baseboards, additional wiring, and full insulation can be installed in new homes, whether custom built or in projects, for practically the same cost as for a fuel-fired furnace and central air-conditioning equipment . . . Commercial installations of resistance equipment and heat pumps cost less in almost all instances than conventional fuel-fired equipment and air conditioning.

(*Continued on p 74*)

building block for practical achievement of the end is electric space heating. Industry demand forecasts and sales growth needs show why:

Between 1958 and 1975, *Electrical World* projects the following increases in total energy sales (in billions of kwhr):

	1958	1975	% of Total 1958	% of Total 1975
Residential	161.2	708.0	28.4	33.8
Industrial	272.2	862.6	47.9	41.2
Commercial	100.9	443.9	17.8	21.2
Other	33.6	80.1	5.9	3.8
TOTAL	567.9	2,094.3	100.0	100.0

Note in particular that projected growth in residential sales—from 28% of the total in 1958 to 34% in 1975—outpaces that of other categories. Part of this growth will come naturally from population increases which are expected to add some 23 million residential customers by 1975. But the lion's share of the growth will have to come by almost tripling consumption per customer from a national average of 3,408 kwhr in 1958 to 10,052 kwhr in 1975.

To utility men, achieving this order of consumption boost means that selling must center on some new force that will break through the kilowatthour barrier caused by increasing saturation of the electric-appliance market and stiffer competition from gas for the appliance energy-consuming dollar. Bruce A. Fleming, vice president, Edwin L. Wiegand Co., a leading manufacturer of electrical equipment, has crystallized what many would concede is the answer:

"When it comes to electric-utility promotions, electric heating is such a centripetal force. To illustrate my point, I should mention that the electric utilities are engaged at this time in four big nationwide residential promotions: (1) 'Live Better Electrically,' (2) 'The Medallion Homes Program,' (3) 'The Comfort-Conditioned Homes Program,' and (4) 'The House Power Program.'

"All four of these giant promotions are in themselves somewhat multidirectional; all capably doing their part of the big job—but still falling far short of the final goal of the utility industry. I submit that electric heating, as a focal point, presents centripetal promotional possibilities within the scope of each of these programs—and electric home heating can go even so far as to tuck these multidirectional programs under its wing . . ."

In line with Mr. Fleming's proposal,

What Coal-Burning Electric Utilities Are Saying (Continued)

Operating costs for electric resistance heating in the residential field are comparable to those for oil furnaces, when considering all factors of fuel, maintenance, and electrical energy to operate furnace blowers and fuel pumps. This is on the accepted basis of fully insulated homes with electric heating and only minimum ceiling insulation for the home with a furnace. On the same basis, costs to operate a heat pump in a home are substantially lower than for an oil-fired installation; for commercial heat pumps costs are normally comparable or lower than for a conventional system.

ALABAMA POWER CO.—Practical electric heat for the home was for many years a dream beset with all sorts of difficulties, technical, economical and psychological. Yet, it presented a definite challenge to Alabama Power Co. which has always been anxious both to maintain a steady growth in its sales and operating efficiency, and to make its service of maximum value to its customers.

It was this attitude on the part of the company that in the early 1940's led to its interest in the potentialities of the heat pump. If this application of electricity could be successfully developed, it promised to be an essential element in achieving the practical all-electric home and in fulfilling a long-standing dream . . .

As the acceptance of the heat pump and other types of electric space heating has broadened, Alabama Power Co. has realized its potential as a source of a substantial and highly desirable electric load. Prior to 1952, the system load of the company always reached a definite peak in the winter months. The acceptance of summer air conditioning as a necessity for modern living has completely reversed this trend in recent years, however, and for the past 6 yr the summer peak on the company's system has increasingly exceeded the peak for the following winter. The use of electric space heating and the heat pump promises to be an ideal means of leveling out these peak requirements . . .

Insofar as cost of installation is concerned in the service area of Alabama Power Co, ceiling cable, wall inserts, baseboard units and other of the simpler methods of electric heating, can generally be installed in the customer's home at a cost which is comparable and, in some cases, less than that incurred in the installation of conventional heating systems. Our experience indicates that the heat pump can also be installed at a cost comparable to that of a conventional heating system plus central air conditioning.

Provided electric heat is installed properly, there is very little difference in its cost of operation compared with that of conventional heating systems. This is particularly true when the many other advantages of electric heat are considered including its cleanliness, freedom from trouble, even temperature, odorlessness, and freedom from fire hazard and excessive condensations. Electric heat is never recommended unless the customer insulates according to company specifications . . .

As a result of aggressive promotion, Alabama Power Co. confidently expects to obtain a rapidly increasing amount of desirable electric heating load from all types of customers in future years. Through Dec. 31, 1957, a total of 858 electric heat pump installations had been placed in operatin in the company's service area. These installations involved the use of 1,002 separate units. The company also had record of a total of 1,800 electric space heating installations on its lines as of that date. Already during the first 8 mo of 1958 another 292 heat pump installations have gone into operation in the company's service area. Eleven of these are in company offices, 220 are residential, 57 commercial, and 4 industrial. During the same period, residential sales engineers reported 197 homes equipped with electric space heating.

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the Edison Electric Institute plans a coordinated "Residential Sales Program." For what is believed to be the first time, this program—due to become effective in February, 1959—will give industry-wide stature to electric heat promotion and the concept of all-electric living.

With such industry-wide backing, chances are better than fair that the electric-utility industry will succeed in breaking the kilowatt-hour barrier. And what would this mean to coal? The answer is both simple and staggering:

Where coal-burning utilities now consume about 2 tons of coal annually to meet average electricity needs of the conventional home using 3,500 kwhr, they must burn 4½ times as much, or 9 tons, to supply the average of 20,000 kwhr needed by the all-electric home.

Electric heat's significance to coal, however, really goes much further. At the NCA convention last June, Gordon R. Corey, vice president, Commonwealth Edison, Chicago, Ill., presented this picture, for example:

"Thirty years ago, the average homeowner in Chicago used 8 tons of coal a year to heat his house. The domestic market was big business for the coal industry. Since then, oil and gas have taken over. Retail sales in the Chicago area have dropped from 6 million tons in 1927 to about 2 million tons in 1957 . . .

"[Now, our experience shows that] the average electrically heated home in Chicago will use about 16,000 kwhr of electricity a year for heating—equivalent to 8 tons of coal. But the picture is even brighter when electric heat is installed: Other appliances go electric—cooking, water heating, clothes drying and air conditioning—adding 6,000 kwhr additional to the user's load or 3 additional tons of coal per year. Thus, an all-electric home, in effect, will use 11 additional tons of coal a year—3 tons more than would have been used in the old days to heat such a house with coal."

Consumer Acceptance Widens

Plans for accelerating growth in electric space heating should in no way obscure these facts:

1. The market is already a growing one with immediate prospects for continued growth.

2. Consumer acceptance is a nationwide phenomenon—no longer confined to the TVA and warm-weather regions.

3. School and commercial outlets are becoming an increasingly important segment of the market.

Already a Growing Market—The market for electric heating—both resistance and heat-pump types—has risen steadily since the end of World War II, with especially sharp gains in the past 2 yr.

Until 1946 the number of homes and buildings completely heated by electric resistance heat was "ex-

Electric Heat Solves A Wintertime Headache

KEEPING DRIVEWAYS clear of snow is a wintertime headache shared by millions of homeowners. An increasing number, however, are solving the problem by installing heating cables beneath driveways. And the cost of operating a snow-melting system need not be prohibitive when measured against its convenience and actual or self-assumed costs of hand removal.

An article in the *General Electric Review* (November, 1958) cites typical cost experience: In Columbus, Ohio, $31.50 a year to keep a 70-ft driveway clear; in Westchester County, N. Y., $19 for a 45-ft driveway.

"A Connecticut man living in the northern part of the state found that one particularly bad storm, with a recorded 10-in snowfall, cost him about $3 in electric power cost to melt the snow in his 70-ft, driveway," the magazine states. "This was about the going rate for boy shovelers in the neighborhood."

Cable layouts should be based primarily on average melting-capacity needs of specific localities, as shown by years of accumulated weather data on snowfall, temperature, wind velocity, and humidity. Design rates are then calculated to melt about 80% of the snow that falls—the usual degree of effectiveness needed to keep a driveway clear.

When estimating annual operating costs, hours of operating time are usually figured at double the average annual snowfall. This allows for the fact that on-and-off manual switch operation will not always coincide with the beginning and end of each snowfall. Possibility for the future: automatic operation.

tremely small" and almost exclusively confined to some sections in the TVA area and the Pacific Northwest. In 1950, TVA counted 35,000 completely electrically heated homes and buildings and, 5 yr later, 145,000. During this period and since 1955, investor-owned utilities, co-ops and municipals became more active with this result: The year-end nationwide count rose from 270,000 in 1956 to 290,000 in 1957 to an estimated 321,000 in 1958.

Most observers agree that future growth will be still faster. By 1960, for example, it is estimated there will be one million homes and buildings heated by electrical resistance heat; and by 1965, three million.

Growth in the number of heat-pump units installed in homes and buildings is equally striking. As late as 1946 installed units totaled only 114. By year-end 1956 they numbered 13,000. And at year-end 1957 and 1958, respectively, the count moved up to 23,500 and to an estimated 37,000. In 1960 and 1965, respectively, installed units should total 75,000 and 210,000.

Nationwide Acceptance—In a 1957 survey of 43 heat-promoting utilities, *Electrical World* confirmed what was strongly suspected in previous years: "Electric heat is no longer limited to the South." As a matter of fact, almost three-fourths of the heat-promoting utilities reporting in 1957 were north of the mythical Mason-Dixon 4,000-degree-day line.

Worth noting: Three fifths of heat-promoting utilities do not have, but are anticipating, shifts to summer peaks. Also, the volume of electric resistance heating is about the same in the North as in the South and may be shifting in favor of the North. The South outpaces the North better than three to one on heat pumps but the gap should close in future years as manufacturers report breaking the temperature barrier with improved designs.

Leaders in the volume of electrically-heated homes are still in the TVA region and the Far West. Among these, at year-end 1957, were the following:

Investor-Owned

Portland General Electric	28,000
Southern Nevada Power	20,000
California Oregon Power	14,000

Publicly-Owned

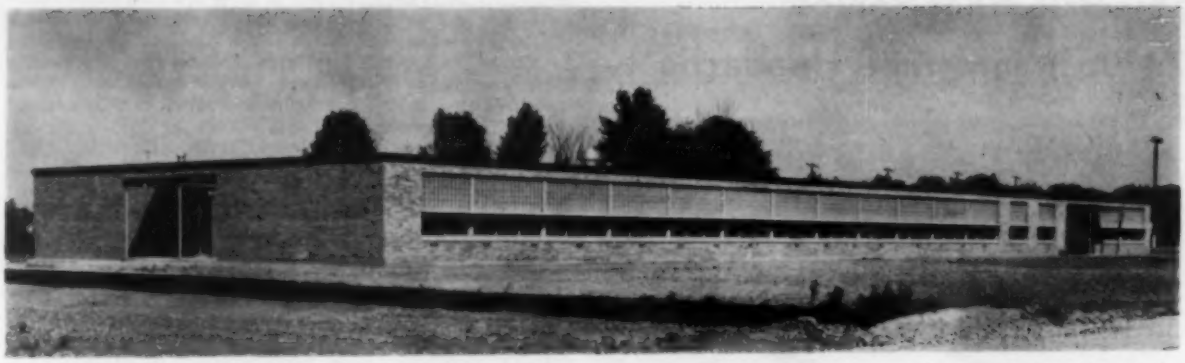
Nashville Electric Service	30,000
Electric Power Board of Chattanooga	25,400
Knoxville Utilities Board	16,500

Electric heat promotion and service has, however, now spread to all parts of the country, encompassing such companies, for example, as the following, of which all but the last five are coal-based:

Indiana & Michigan Electric.
Indianapolis Power & Light.
Detroit Edison.
Consumers Power (Mich.).
Commonwealth Edison (Ill.).
Ohio Power Co.
Cleveland Electric Illuminating.
West Penn Power.
Metropolitan Edison (Pa.).
Western Massachusetts Electric.
Atlantic City Electric.
Virginia Electric.
Appalachian Electric Power (Va.).
Carolina Power & Light.
Alabama Power.
Tampa Electric.
Kansas Gas & Electric.
Arkansas Power & Light.
Texas Power & Light.
Louisiana Power & Light.

Among coal-burning utilities, the American Electric Power System—now burning some 10,500,000 tons of coal annually—spearheads the drive for electric heat. Included in the system are eight companies operating in the heart of coal-producing territory: Appalachian Electric Power Co., Roanoke, Va.; Indiana & Michigan Electric Co., Ft. Wayne, Ind.; Kanawha Valley Power Co., Charleston, W. Va.; Kentucky Power Co., Ashland, Ky.; Kingsport Utilities, Kingsport, Tenn.; Ohio Power Co., Canton, Ohio; Seneca Light & Power Co., Attica, Ohio; and Wheeling Electric Co., Wheeling, W. Va.

AEP companies currently count some 12,000 electrically-heated homes among their customers. By 1962 a count of 65,000 is expected; by 1975 the goal is 500,000 or 25% of all residential customers.



ALL-ELECTRIC Parkside Grade School, Hartford City, Ind., is a pacesetter in modern school design. Electric heat facilitates new additions and eliminates hazards of combustible fuels. Heating cable provides warm floors for kindergarten students. Other electric features: automatic ventilation, hot water, trash disposal, and a master control panel.

The drive for electric heat by coal-burning utilities has special significance to coal. For this reason, *Coal Age* asked two AEP companies—Indiana & Michigan and Ohio Power—and three others — Commonwealth Edison Co., Indianapolis Power & Light and Alabama Power—for a run-down of their experience to date. Replies are featured on pp 73-74.

Commercial Market a New Frontier—In schools and commercial buildings utilities are finding a new frontier for space-heating sales. As put by C. F. Kriser, general sales manager, Edwin L. Wiegand Co.:

"The commercial market has been essentially unexplored and unpromoted by utilities and manufacturers alike throughout the years. But it is a market that is growing . . . it's a market that presents a new opportunity . . . it's a market that has created a surprising interest in recent years."

Utilities' stake in the market, Mr. Wiegand adds, is fourfold: "Sales of large kwhr . . . selective filling-in-the-valleys of system load curves . . . good power factor . . . and a huge new market."

A substantial start in realizing growth potentialities in the commercial market has already been made by numerous heat-promoting utilities. Especially notable is AEP experience. Data on the total number of commercial customers are not available. But the System reports adding 17,000 kw of equipment capacity last year to serve commercial and industrial space-heating customers. This year, new capacity additions will total 22,000 kw.

Heat-promoting utilities find their opportunities for customers run the gamut of the commercial field—banks, stores, business offices, apartment houses, schools, churches, motels, theatres, restaurants, libraries, municipal buildings, etc. "But, of all the markets for electric heat applications, none is 'hotter'—and perhaps ultimately more important—than that of schools," *Electrical World* reports.

Speaking on the school-growth experience of the AEP system, Paul W. Emler, assistant vice president, American Electric Power Service Corp. says, in part:

"Beginning with the Parkside School at Hartford City, Ind., in 1954, we now have 12 electrically heated schools in use . . . Twenty-six more schools using electric heating are either under construction or contracts have been let for their construction . . . We therefore have, as a result of our activities, 38 schools in our service area which are using or have decided to use electric heating . . . In addition, our people are working on another 25 schools where electric heating is being seriously considered.

"The acceptance of electric heating in our area is not yet what we would like to see it, but it is growing rapidly. The high point of our experience occurred, I think, [last May] when, in a single week four school boards in our Indiana area decided to use electric heating for new schools. We expect this acceptance to increase and electric heating to grow rapidly in our area. I am sure it can also grow in many other areas if positive steps are taken by utilities to promote this load. It can be sold."

Much of the pick-up in the school market stems from increasing interest of school people themselves. Why? Hugo E. Beck, a St. Louis school superintendent, suggests one answer:

"Education today is in the process of dynamic change and the type of education in the very near future will demand a radical evaluation of our time-crusted ideas in school construction. To complement these fundamental trends in educational programming is the concept of electric space heating. Succinctly stated: 'Design a classroom to capitalize effectively and efficiently on modern basic educational trends and you have designed a room with all the prerequisites for electric heat.'"

Packaged Selling: A New Approach

Outstanding in the current campaign to expand use of electric heat is a new sales approach which stresses selling the package of costs and advantages rather than just costs alone. Advantages listed for electric heat usually include the following:

It delivers 100 Btu of heat for 100 Btu of energy bought.

It distributes heat with minimum losses since maximum insulation is required.

It is fully automatic, with automation dependent on the same energy source as the heat.

It offers room-by-room temperature control.

It saves space—no boiler rooms, chimneys, fuel storage areas, fuel lines, etc., are needed.

It is completely safe, clean and healthful.

It requires little or no maintenance.

When these advantages are packaged with actual operating costs, utilities figure they can present a strong case in refuting extravagant claims of gas and oil competition. In

How Electric Heat Works

ELECTRIC HEAT can generally be divided into two basic types: Radiant heating which is a unit (room-by-room) system—and the heat pump, which is usually a central system. Unit systems create heat within the room or area where it is wanted while central systems create heat in one location and distribute it throughout the home by means of ducts or pipes.

Briefly, here is how radiant electric, or direct conversion, heating works: By passing current through a wire or other conductor which offers resistance to current flow, electricity is directly converted into heat in the room where it is needed, and because the units are in the room, no heat is lost in ducts or pipes. It is the same clean, flameless heat which works the electric iron, toaster, range, or clothes dryer. Radiant heaters can be purchased in many models and sizes to suit most any heating application . . .

A heat pump operates exactly the same as a refrigerator. The refrigerator chills by removing heat from the contents inside and giving it off into the kitchen. In the same manner, the heat pump extracts heat from the outside air, water or ground and delivers it into the room either directly, with a roomtype heat pump, or through ducts or pipes, with a central unit. Furthermore, it can be reversed in summer to act as an air conditioner, cooling the inside of the house.

Radiant heat and the heat pump each offer many of the benefits of electric heating. However, the three biggest advantages—completely silent operation, room-by-room temperature control and virtually no repair costs—can be had at the present time only with radiant units. The initial cost and maintenance on the heat pump are higher, but it only uses about two-thirds as much electricity for heating. Heat pumps offer many exclusive advantages for commercial and industrial applications—Commonwealth Edison Co.

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other words, it is the best way to undercut the all-too-prevalent notion that electric heat is too expensive.

Even on costs alone, the competitive situation has become more favorable. In *Electrical World's* 1957 survey of heat-promoting utilities, 45.5% reported rates of 1½c or less per kwhr; 23%, 1½ to 2c; 23%, 2c; 8.5%, more than 2c. (Six out of the 100—large municipal and public power systems—reported rates ranging from 4 mills to 2c, with lowest rates in the TVA area.)

This breakdown, the magazine states, "backs up recent comments of some Indiana electric co-op men. Their slogan: 'Two cents competes, but 1½c converts.'"

Again interesting is the experience of the AEP companies which operate in seven states where heat requirements range from 3,600 degree-days in Tennessee to 6,500 degree-days in northern Indiana and southern Michigan. Paul D. Brooks, vice president of the AEP's Service Corp. advises: "Our records show that last year our residential heating customers, both resistance heat and the heat pump, used an average of 19,126 kwhr a year [for both heat and other electrical uses]. They paid us an average annual bill of $291.32 . . ."

AEP's Indiana & Michigan Electric Co.—operating in the upper range of the System's degree-day range—presents a cost-case history of two homes identical in space volume and "very comparable" in family size and in living habits:

	Gas Heat	Electric Heat	Other Electric Uses	Total Utility
Family G	$173.99	.....	$157.43	$331.42
Family H	.....	$210.54	161.01	371.55

Electric heat here cost $36.55 a year or about $3 per month more than gas heat. Other case histories show differences in annual heat costs as low as $20. Such data support I & M's conviction that, if a home is properly insulated, it can offer electric heat to residential customers at costs ranging upward from about $20 per year, or $1.65 per month, more than conventional heat.

On commercial heating costs, utilities are also building a strong case based on (1) lower rates made possible by characteristics of the commercial load and on (2) "hidden costs" of the flame-fired system. Hidden costs are wrapped up in higher costs for initial building construction, bond financing, operation and maintenance.

Some pose the question: "What are the advantages to the school and taxpayer?" Mr. Emler, AEP Service, gives this answer which also applies, in substance, to the commercial market generally:

"Our experience has shown that electric heating will either reduce the actual cost of a school facility or it will give the taxpayer more school for his dollars. In addition, a school can have a topnotch system with proved equipment that costs no more to operate than an ordinary system. It can have a system that won't be out of date in 5, 15 or 25 yr, and which, because of the probable future costs of electricity and fossil fuels, will become relatively cheaper to operate every year . . ."

Packaged selling of advantages and costs is paying off in a rising tide of consumer satisfaction. A May 12 editorial in *Electrical World* makes this comment: "Only two groups of people are worrying about the cost of electric heating—our competitors and us."

By and large, however, heat-promoting utilities are recognizing that consumer satisfaction is swinging in their direction. As a result, most are beefing up promotion programs to include these elements: Special electric heating departments, close cooperation with trade allies, budget billing, engineering aid or recommendations for layout and insulation work, testimonial advertising, clear-cut customer-relations policies, and training programs for employees, salesmen and trade allies. Before promoting electric heat, most study its effect on the system load.

Success Needs: Internal Unity, Allies' Cooperation

Teamwork is indispensable – that sums up the credo of those seeking to promote maximum growth and to beat intense oil and gas competition in the electric space-heating market. Within its own ranks the utility industry must consolidate for unity-strength. It must also strive for peak

cooperation from allied groups, including equipment and insulation manufacturers, the building trades and professions, and from its major raw-material supplier—coal.

Within utility ranks, there is still much ground to be gained among combination companies which serve both gas and electric markets. Among the heat-promoting utilities reporting in *Electrical World's* 1957 survey, 82% were straight-electrics and 18% combinations. Combination companies are a principal roadblock to growth because, in effect, they create a house divided against itself. But many are believed playing a wait-and-see game and will hop on the electric-heat bandwagon as (1) summer peaks become more burdensome and (2) more recognize electric heat as the key to the all-electric home and added revenues.

Outside the utility industry most allied groups are measuring up to their interest. Those with, or considering, active programs devoted to electric space heating include, for example, the National Electrical Manufacturers' Association, the National Association of Electrical Distributors, the National Mineral Wool Association and the National Electrical Contractors' Association.

On the local level, E. O. George, vice president, Detroit Edison Co., presents what might be a typical picture:

". . . We feel that electric heat demands closer work with allies than any other product. Thus, we are meeting with insulation contractors, dealers, distributors, architects, consulting engineers, manufacturers representatives, FHA, VA, other financial institutions, and electrical contractors —in fact, anyone who has a stake in the marketing of electric heat or whose interest we can arouse."

Detroit Edison also offers training for electrical contractors, Mr. George adds. "So far [mid-1958], more than 550 electrical contractors have been exposed to electric space heat training. We plan to continue these schools throughout our service area. In all meetings, we emphasize the need for close follow-up on installations. Grievances occur when the seller has not done the right job for the customer—not because of operating costs."

Because proper insulation is stressed down-the-line on electric-heat installations, the full cooperation of insulation manufacturers is a good sign. R. E. Ingmire, manager, industrial activities, "Live Better Electrically," for example, reports:

"The major insulation firms in this country and Canada, through the National Mineral Association, have been conducting a vigorous consumer publicity campaign through general circulation magazines, shelter books and local newspapers. They have a continuing program of technical assistance, including training schools and instructional material, which has been helpful and has interested local trade groups in electric heating. They have also produced an excellent booklet on insulation for electric heating."

Not to be underestimated is the fact that equipment manufacturers say they now offer full lines of equipment for resistance-heat and heat-pump installations. How these basic types of electric heat work is described in the panel on p 77. Technical advances in equipment design are, of course, still being made to improve comfort for the customer and to make the load more attractive for utilities.

Resistance-heat equipment still dominates the total market but all signs point to a speed-up in heat-pump sales. The number of heat-pump manufacturers has grown in the last 4 yr from 6 to 26, many of whom are tagged "the most marketwise in the country."

"These new manufacturers," Ebasco Services' W. L. Byrnes says, "have helped to expand the market for heat pumps. They have done this by offering a wider variety of product lines than any one manufacturer could ever hope to offer. A customer can now buy a unit designed for horizontal, vertical, indoor or outdoor mounting; in one or two pieces for locating inside or out of the conditioned space.

"Then, too, the heat pump is far more competitive than it has ever been before. More competitive in two ways—first cost and operating costs. Average installation costs today are $400 to $450 per cooling ton which brings them down about equal to separate conventional heating and cooling units. And, on operating costs, the heat pump also provides year-round comfort conditioning at a reasonable cost."

Worth noting: One top manufacturer now advertises a multistage compression, air-source heat pump which is both practical and economical in subfreezing cold climates and needs no supplementary air heaters.

Needed from Coal: Positive Support

Coal's interest in electric heat is so far only sporadic. Notable in particular in 1958, at least two industry meetings (*Coal Age*, June, 1958, p 119; July, 1958, p 106) and a series of articles in the UMWA Journal featured discussion on the subject.

UMWA in 1956 also polled 136 coal-burning or prospective coal-burning utilities to find out what the coal industry can do to stimulate public and consumer interest in electric heat. Detailed results have not been released but unofficial comment to *Coal Age* underscores one main fact that will come out of the poll: Utilities would welcome coal's entrance into the promotion program.

Irrespective of where coal stands now, it would be difficult to deny the industry's two-pronged stake in electric heat as defined in the introduction of this article. It would be equally difficult to deny the need for setting up an industry committee to study a promotion program and how to integrate it into coal's present merchandising structure.

Some coal companies with heavy stakes in retail and commercial markets might take exception to promoting electric heat since it appears competitive with direct use of coal for space heat. Coal industry analysts, however, see no real conflict. One authority suggests that any apparent conflict might be resolved with this approach to consumers:

"Certainly Pennsylvania anthracite is still a best buy for all home and space heating purposes. And certainly bituminous is the cheapest fuel available for keeping people warm. But if you, as a consumer, want ultra-modern, ultraconvenient and ultra-clean heat, electricity is the answer. And here coal stands ready to serve the Nation by producing the electricity to heat your home or other buildings."

In other words, where modern coal-burning equipment cannot be sold to customers or prospects, give them the alternative of coal converted

to electric heat. Isn't this better than seeing them turn to gas or oil? Isn't this the answer to eventually regaining millions of customers and to recapturing at least a large part of the 65 million tons of retail coal lost to gas and oil during the last 15 yr?

If coal management has doubts about how the partnership between coal and electric power can be promoted successfully, recall the now famous "Coal by Wire" program started by Appalachian Power Co. in 1955.

APC launched the program through an institutional advertising campaign featuring the idea: "Everytime You Use Electricity—You Burn Coal." Behind the idea was recognition of strong mutual ties between APC and the coal industry. On one hand, APC buys some 3.5 to 4 million tons of coal annually from West Virginia coal companies; on the other, APC sells a major part of its electricity output to West Virginia coal companies and coal communities.

Reaction to the program was "a little short of phenomenal," APC states.

Area electric appliance sales increased noticeably as the "Coal by Wire" theme was picked up by many retail outlets and coal company stores, including those of Red Jacket Coal Corp., the Guyan Eagle Coal Co. and Island Creek Coal Co.

Hundreds of letters from community leaders extolled ACP's boost to the coal-based economy of its service area.

The conservative Charleston (W. Va.) *Gazette* featured an editorial entitled, "Coal by Wire Is More Than Just a Slogan—It Means Markets for Coal—and Also Jobs."

William C. Marland, then Governor of West Virginia, crystallized what must have been the thoughts of many. He wrote to APC:

["'Coal by Wire'] is a very graphic example of the vision and imagination necessary if we are to protect the economy of our communities. I do not consider it too optimistic to say that [this program] will soon take the place of our competitors' cry that oil and gas are cheaper and more convenient."

Now, "Coal by Wire" has become an industry slogan and a major APC sales tool for promoting electric heat. APC residential and commercial space-heating customers have reached 400 and growth to 4,000 by 1965 is considered within reach. Current customers, incidentally, include Amherst Coal Co., Omar Mining Co. and Valley Camp Coal Co.

Call of the Day

All signs point to electric heat as the key to the all-electric home. In turn, utilities now recognize the all-electric home as a central building block to realize maximum growth potentials in kwhr sales. The recognition — though not universal among utilities—is widespread and, with increasing momentum, is being translated into well-organized, aggressive promotional activities.

Make no mistake, however, gas and oil are deeply entrenched in the space heating market. And a monumental selling effort, encompassing coal and all other vested-interest groups, is the call of the day if these competitive fuels are to be uprooted and electric heat is to move from "coming of age" to full-orbed maturity.

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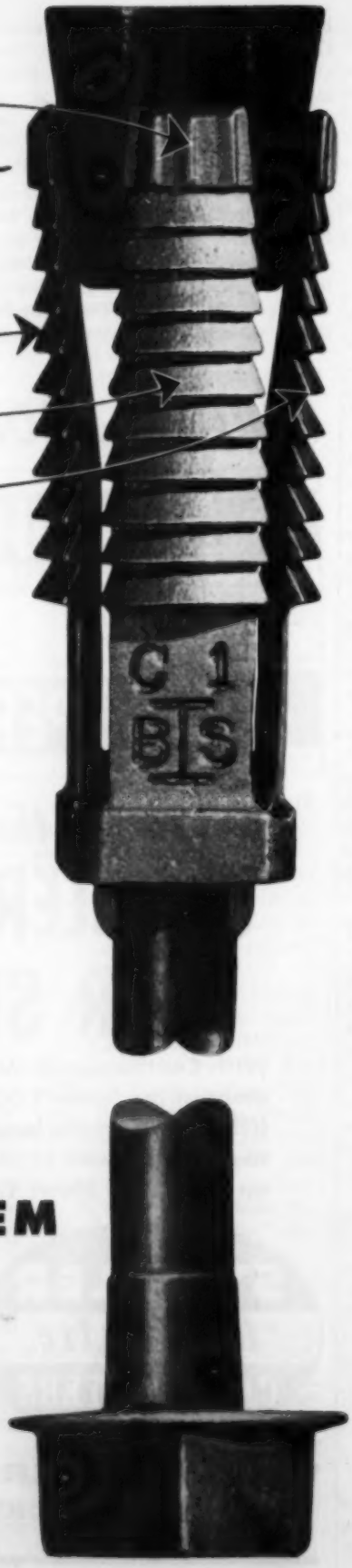
Here's where it takes hold



This is the expansion shell used on the end of a Bethlehem Headed Roof Bolt. Inserted in a hole drilled into the mine roof, the serrated leaves of the shell expand quickly when the tightening of the bolt draws the plug down on the threads. In a matter of seconds, the shell and bolt are locked in the hole, thus providing a firm, secure roof.

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The Bethlehem Headed Roof Bolt, used with the malleable-iron shell, is furnished in three diameters, each of which is made in varying lengths. The ¾-in. carbon bolt and the ⅝-in. high-strength bolt have a typical breaking load of 24,000 lb; and the ⅞-in. high-strength bolt has a typical breaking load of 45,000 lb.

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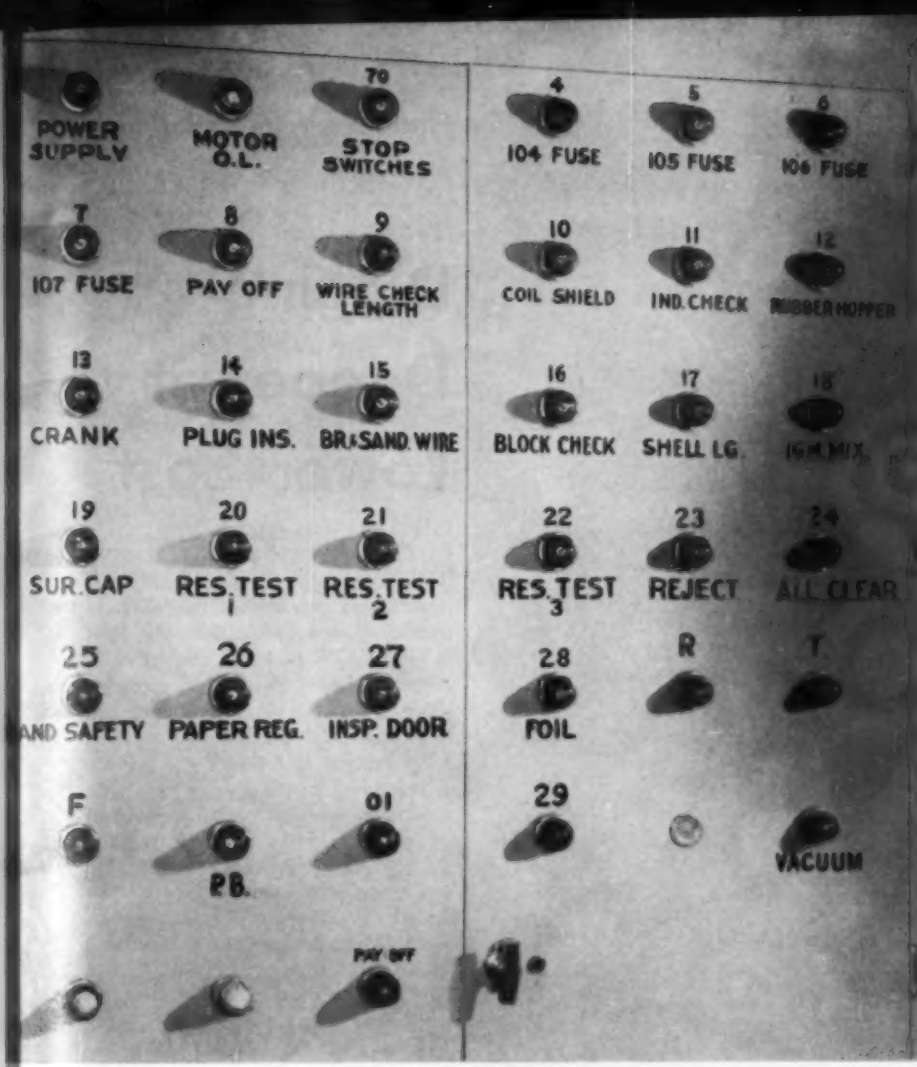

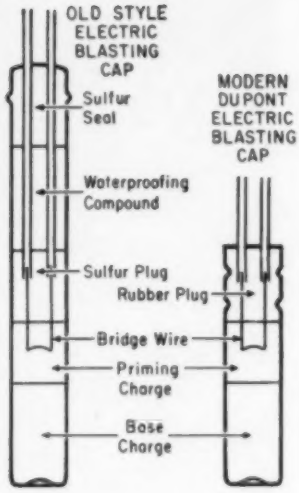

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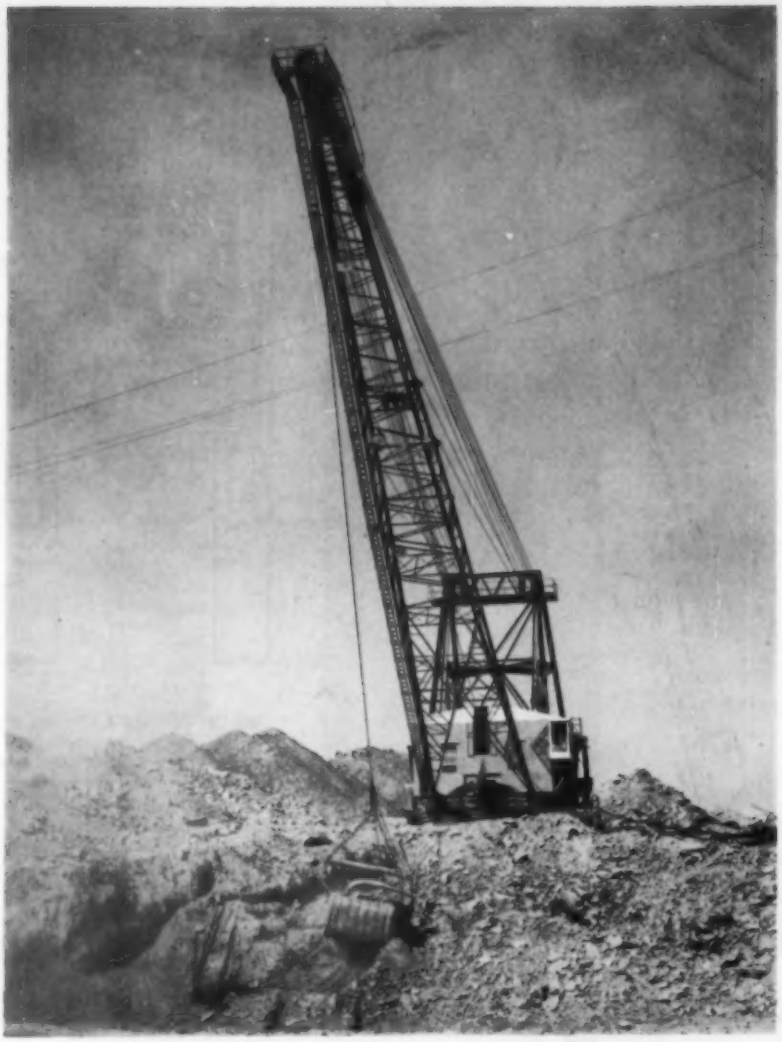


MAJOR STRIPPER swings 14-yd bucket from 160-ft boom, works around the clock while cutting 100-ft swath through 40 to 50 ft of cover left by shovel.

TOP OFFICIALS J. O. Williams (left), assistant general manager, and George Hart, partner and general manager discuss plans in mine office.

Flexibility in operation and new techniques are keys to . . .

Digging Deeper at Lower Cost

CUTTING OPERATING COSTS while digging to higher banks and maintaining maximum flexibility in operations are two targets for Hart & Hart Coal Co., Providence, Ky. To achieve these aims, the company pursues a policy of adding new and more powerful machines as well as adopting new techniques.

Beginning in 1951 with the addition of a modern preparation plant (*Coal Age*, February, 1952, p 102), the company has continually added improvements. Today Hart & Hart mines 750,000 tons of coal per year from two pits, employing a Marion 7400 dragline with a 14-yd bucket as a major stripping machine on one pit and a Manitowoc 4500 dragline with a 7-yd Hendrix bucket in the other. Working with these two draglines is a Manitowoc 4500 shovel powered by a Cummins VT-12-I diesel engine and swinging a 5½-yd dipper. The unit moves from pit to pit to make working benches for the draglines. A Caterpillar D9 bulldozer with a Kelly hydraulic ripper adds flexibility to the operation by ripping a 3- to 6-ft layer of shale over the coal, ripping the coal itself, helping the 4500 shovel move overburden, and building drill road.

To provide maximum flexibility in operation and simplify equipment moves as much as possible, the company relies on diesel-powered machines. For example, the Bucyrus-Erie 40R overburden drill, Manitowoc 4500 shovel, 4500 dragline and three Northwest coal shovels are diesel-powered. The Marion 7400 dragline is the only electrically powered machine owned by Hart & Hart.

Overburden includes both gray shales and sandstones of varying hardness. Throughout the property

DRILLING and charging of 9-in blastholes are closely coordinated. Company makes own explosive mixture.

DOUBLE-DUTY service in two pits is assigned to diesel-powered 5½-yd shovel. Unit makes bench for draglines.

SECOND DRAGLINE with 7-yd bucket and 100-ft boom uncovers 70-ft strip of coal. All machines work 24 hr a day.

BREAKING COAL for a shift of loading takes only 45 min of ripper's time. Minimum of lumps and fines are produced.

there is a 3- to 6-ft layer of hard gray shale immediately above the No. 14 coal. Above this is 50 ft of softer shale, then 12 to 40 ft of sandstone. The sandstone is marked with vertical cracks which frequently cause it to break up into large boulders. These boulders are the biggest problem the company has to cope with in removing overburden. The interval between the No. 11 and No. 14 coal consists of shales, limestone, and thin, unminable coal beds.

Drilling and Blasting

A Bucyrus-Erie 40R dry-type overburden drill, operating 8 to 12 hr per day depending on pit conditions, handles all the drilling in both pits. Equipped with a Chicago Pneumatic 9-in bit, the machine sinks an average of 1,100 ft of blasthole in 8 hr of drilling. A bit cuts an average of 21,000 ft of hole before being retipped, which adds considerably to bit life. Up to a total of 40,000 ft of hole has been drilled with a bit before final discard.

The 40R drill is powered by a Caterpillar D337 diesel engine, which also drives the Gardner-Denver 700-cfm compressor supplying air for flushing out drill cuttings.

One man operates the 40R drill and a helper divides his time between miscellaneous duties on the drill and charging holes with explosives. Holes are drilled in a diamond pattern in three rows spaced 21 to 24 ft apart, depending on the thickness and hardness of the material. Distance between holes in each row ranges from 26 to 28 ft. They are drilled only to the hard shale layer over the coal.

Hart & Hart mixes its own blasting agent, using Spencer ammonium nitrate prills, carbon black and fuel oil. The ingredients are mixed mechanically in the company's own plant and then packed in 48- and 52-lb bags which are stored in pallets for easy handling. Two men operate the mixing and bagging plant and deliver the product to the drilling site in a Dodge truck on days when blasting is done.

One pound of carbon black and 3 qt of fuel oil are added to each 100 lb of nitrate and then thoroughly mixed mechanically before being bagged. Management believes that thorough mixing is necessary to get the maximum efficiency from the blasting agent. By using the combination of lamp black and fuel oil, the company says the mixture repels water better and also stores better in the bags.

The quantity of blasting agent used varies between 1 lb to 2½ cu yd and 1 lb to 4 cu yd of overburden. It averages 1 lb to 3 cu yd.

Starting at the bottom of the hole,

LOADING is carried out in two pits by 3- and 4-yd shovels operating two shifts per day. Third shovel is available as spare or for loading in third pit.

DESTINATION of coal trucks is bin feeding 180 tph to modern preparation plant equipped with heavy-media washer and wet tables. Plant is 2 mi from pit.

loading is as follows: 1 bag of blasting agent; 12½-lb primer of Austin AL4 attached to detonating fuse; 4 or 5 bags of blasting agent; 10 ft of stemming; then 6, 8 or 10 bags of blasting agent with another primer, depending on the thickness and type of rock. Drill cuttings are used to stem holes to the surface.

Holes are loaded every day and a shot is put off every other day because of the possibility of water seeping into the holes. If water is detected in a hole, 50-lb cartridges of Hercules nitrate-type explosive are used instead of the company's own mixture. The same primer is used with both types of explosives.

If explosives are being loaded in holes adjacent to a previously shot bank, 9-MS delay connectors are used between the first two holes in each row. Otherwise, 17-MS connectors are used. In all shots, 9-MS connectors are used between rows.

Whenever possible, the company likes to use explosives to throw as much overburden as possible into the pit, thus decreasing the work load on the stripping machines. As much as 25% of the overburden frequently is moved with explosives alone.

Hart & Hart removes as much as 110 ft of overburden with the Marion 7400 and 85 ft of material with the Manitowoc 4500 dragline. In pits where the cover is unusually thick the company sometimes shoots against a 40-ft buffer because the stripping unit cannot take the full width in one pass.

Uncovering the Coal

Coal is being loaded from two pits at the present time and sometimes the company has three active pits. Swinging its 14-yd bucket from a 160-ft boom, the 7400 dragline works around the clock in one pit and the Manitowoc 4500 dragline with its 100-ft boom and 7-yd bucket works 24 hr per day in the other. The 14-yd machine cuts a 100-ft swath through the overburden and the 7-yd stripper uncovers a 70-ft strip. In pits where the cover is thin the Manitowoc 4500 shovel alone handles all of the overburden.

In the thicker cover, such as the company is operating in now, the 4500 shovel cuts down the surface material and sandstone in the two pits, leaving the lower 50 ft of shale for the two draglines. Moving parallel to the highwall and on the half of the broken bank nearest the pit, the 4500 shovel casts as much of the broken bank as possible into the pit. Then a second parallel cut is taken along the solid highwall. The 4500 shovel casts the second-cut spoil as close to the edge of the pit as possible where a D9 bulldozer can easily push it over.

The two draglines then remove the overburden down to the hard layer of shale immediately over the coal. This hard material is torn up by the D9 bulldozer with its hydraulic ripper and then removed with a dragline. Hart & Hart management reports not only a saving in explosives but also an increase in the recoverable coal by using the ripping method on this shale. An added benefit is a speedup in dragline operation when removing this material because it is loose and thus is easier to dig.

Before the ripper went into service this year blastholes were sunk to the top of the coal. Explosives shattered the coal around the holes and, consequently, considerable coal was lost when the overburden was removed. Now the coal is left unshattered, and the loss is at a minimum.

The D9 dozer has a constant-pressure hydraulic pump which is driven from the rear of the crankshaft. The unit also has a hydraulic pin puller on the ripper tooth so that the operator does not leave his seat when adjusting the ripping device.

The company notes that the constant-pressure pump gives live hydraulic action any time the engine is running. Thus the blade, blade tilt or ripper can be operated regardless of engine speed. The net result is more productive work from the bulldozer.

After the ripped shale is removed, the D9 bulldozer returns to the pit and rips the coal seam for loading.

HART & HART SUPERVISORS include R. L. Whitlock (left), and Bruce McCarty, pit superintendents; Shelby McKown, blasting foreman; H. B. Mitchell and W. T. Burgess, preparation foremen.

Hart & Hart Supervisors

Partner	F. M. Hart
Partner & General Manager	George Hart
Assistant General Manager	Jesse O. Williams
Pit Superintendent	Rudy Whitlock
Pit Superintendent	Bruce McCarty
Drilling and Blasting Foreman	Shelby McKown
Preparation Foreman, day	W. T. Burgess
Preparation Foreman, night	Herman Mitchell
Office Manager	George Nobles

It takes only 45 min for the machine to rip enough coal for an entire shift of loading. The dozer then is free to help move overburden or build drill road for the remainder of the shift.

Loading and Hauling

Hart & Hart has two Northwest 78D 3-yd and one Northwest 80D 4-yd diesel-powered shovels available for coal loading. Two of the shovels now load two shifts per day and the third machine is available as a spare or to load coal when a third pit is operating.

Coal is transported 2 mi to the company's preparation plant by a fleet of eight GMC 17-ton end-dump trucks. It is dumped into a hillside storage hopper from which it is fed to the plant at the rate of 180 tph. Cleaning facilities include a heavy-media washer for the plus ⅜-in sizes and Deister SuperDuty Diagonal-Deck washing tables for the fines.

Clean coal is freezeproofed with oil supplied by Centralia Petroleum Co. The plant also is equipped with a Viking hot-oil system for dust-proofing 1¼ x ⅜ stoker size. Refuse is hauled back into the pits by two Ford F6 trucks.

Since the hydraulic ripper has been used to break up the coal in the pit the company notes an increase in plant output of 83.8 tpd. This increase is possible because ripping produces a product with a minimum of fines and large lumps. As a result, the loads on the wet tables and the crusher are less, making it possible for the plant to handle more coal.

In addition to periodically adding new and more powerful equipment the company looks for ways to improve equipment on hand. For example, since buying the 4500 shovel, the company has added a turbocharger to boost engine output and installed the improved Cummins P-T fuel system on the Cummins V12 engine. The new fuel system not only provides better distribution of fuel to the 12 cylinders but also is easier to service.

Improving Shovel Performance

Shovel performance also was improved by exchanging a 25-tooth pinion on the clutch shaft for a 20-tooth gear. This raised the engine speed from 1,100 to 1,400 rpm. With the slower engine speed, the return swing was slow and there was more slippage in the torque converter. Now the engine is speeded up to near normal operating range on the return swing and thus is ready for digging as soon as it swings back to the spoil. The net result is a 5 sec decrease in the operating cycle.

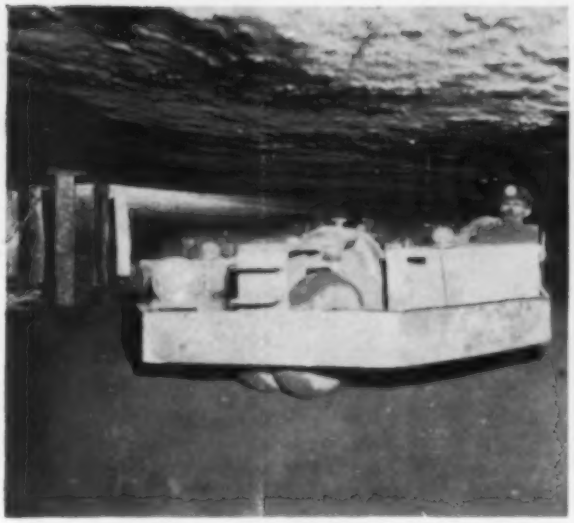
All areas of activity are linked together by an RCA two-way radio system made up of 18 stations. Four are base stations, which are located in the office, shop, truck garage and parts room. Mobile stations are installed on the stripping units, service trucks and supervisors' jeeps, station wagons and cars.

To simplify installation and movement from pit to pit pumps are mounted on amphibious trailers which travel equally well on land or water. The pump and gasoline motor are mounted in the center of the deck, which is large enough to support a drum of fuel oil and a pumper while the trailer is floating in water. The amphibious carrier usually is parked at the edge of a pool of water where it can be easily serviced. If heavy rains come and pit inflow exceeds pump capacity, the company never worries about the pump being flooded because the carrier becomes a barge and pumping continues.

The company also made a self-propelled pump from an old TD-18 bulldozer. A small platform is mounted at the rear of the unit to hold a 10-in Gorman-Rupp centrifugal pump, which is driven by the tractor engine. A small boom with a wire rope and clamp also is mounted at the rear of the tractor so most of the weight of the section line can be transferred to the tractor when the unit is located at the top of a steep bank. This support takes the strain which otherwise would be on the short section of rubber pipe connecting the pump to the rigid suction line. The self-propelled pumper is also able to level off a pumping site with its blade or cut a road to a body of water.

All of the company's equipment is serviced with Ashland oils and greases, except for some special applications on the 7400 dragline where Whitmore grease is used. Wire ropes are supplied by Leschen.

Power is delivered to the dragline by 3,000 ft of SHD cable, made up of 1,000-ft lengths of Anaconda, Okonite and General Electric cable. Energy is received at 4,160 V and is passed through a General Electric skid-mounted power center equipped with a circuit breaker and ground-fault protection before going to the dragline.



1 **HEADED FOR THE OUTSIDE,** tractor and loaded trailers make a round trip in 15 min, including dumping cycle.

2 **TRACTOR TURNS TRAILER** which is then pushed to dump by hand. Trailer is coupled to others by tractor.

3 **DUMPING CYCLE COMPLETED,** trailers are picked up by tractor for return to section and distribution.

4 **POWERED** by eight 12-V batteries and 5-hp motor, tractor develops 2,300-lb drawbar pull and 3 and 6 mph.

5 **BATTERY UNITS** are changed at the middle of each shift and recharged automatically. Operating voltage is 96 V.

6 **COAL IS CUT** by 18-in high machines which average seven cuts per day. Cutters are equipped with 60-ft tail ropes.

Miniature Equipment Boosts Production in Low-Coal Mines

Designed especially for low seams, battery-powered, rubber-tired tractors and 1¾-ton trailers increase output at small truck mines in the Tri-state area of Virginia, West Virginia and Kentucky.

INITIAL LOW COST, ability to operate in seams as low as 24 in, and low operating and maintenance costs are outstanding features of the small low-vein rubber-tired tractors and trailers used by many truck mines. This equipment is an important factor in producing coal economically at these small mines, which often operate in very low seams. Typical is the RB Coal Co., Grundy, Va., which started in the mining business in 1951 with an initial investment of $800. Mining a leased seam of coal, the company produced 11,430 tons the first year and paid royalties amounting to $4,000 at 35c per ton. Today, with $75,000 invested in a new mine, the company, in 1957, produced 41,463 tons and grossed $119,862 from coal sales.

Equipment Features

"Mescher" tractors and trailers, which are used exclusively at RB Coal, are manufactured by Fred's Welding Shop, Grundy, Va. Tractors are powered by eight 12-V Gould batteries connected in series—maximum operating voltage is 96 V—and are equipped with a 5-hp Allis Chalmers motor. They are designed to develop a maximum drawbar pull of 2,300 lb through a Falk speed reducer and Spicer differential. Under normal conditions the tractors can handle from four to six trailers. Each tractor is equipped with a shop-made two-point starter which limits the speed to 3 mph on the first point and 6 mph on the second. Tractors are 10 ft 8 in long, 62 in wide and 22 in high and are mounted on three rubber tires.

The three-wheel trailers usually are built to carry 1¾ tons. However, the capacity can be increased where seam thickness permits additional trailer height. Trailers are 9 ft long, 5 ft wide and 12 in high.

Three tractors and 20 trailers haul an average of 75 cars of coal per shift at the RB Coal Co. Condition of haulways controls the number of trailers that tractors can pull. For example, one section of the mine contains steep grades and has a wet, slippery bottom. Under these conditions the tractor can handle only two trailers per trip. Chains are often used on tires to give additional traction. Haulage distance on the left section is about 1,600 ft and on the right about 2,000 ft. A round trip, which includes spotting empties in each place and picking up loads, takes approximately 15 min. On the right section, where haulage conditions are better, the tractor can handle three or four trailers. Adverse bottom conditions near the outcrop made it necessary to floor 1,000 ft on the left side of the mine and 600 on the right.

Mining Practice

The six-heading system is used in main entry and panels. Headings are driven 22 ft wide on 60-ft centers. One unit works the main headings and the other drives panels.

Each section is equipped with a 212 Goodman cutting machine which cuts an average of seven places per day. One cut produces about 12 trailer loads. Coal is loaded by hand.

Empties are placed in each heading where coal has been shot. Usual practice is to place one empty in the place each time a loaded trailer is picked up. After empties are distributed, the motorman collects loads and takes them to the outside. All trailers except the one next to the tractor are uncoupled. The trailer coupled to the tractor is turned around in an area directly in front of a 60-ton truck-storage bin, pushed onto an end-type car dump and unloaded. The motorman then recouples and sets the trailer to one side. This procedure is repeated until all trailers are unloaded. Empties are then coupled and returned to the section.

The tractors are taken to the battery-charging station at the middle of each shift so that a fully charged set of batteries can be installed and the used set placed on charge. Batteries are charged by automatic chargers manufactured by the Baker Electric Co.

Company Background

The RB Coal Co. leases the mine from the Paragon Jewel Coal Co. and in turn sells the entire output to the lease holder. The mine is in the Red Ash seam, which varies in height from 24 to 30 in. Ash content of the coal is 4.5% before processing through Paragon Jewel's preparation plant. R. S. Clevenger, manager, and three brothers operate the mine. All equipment, buildings and truck-storage bins are installed and owned by RB Coal Co. Paragon Jewel builds and maintains roads, faces up the coal and runs high-voltage power lines to the property.

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that lead to Payhauler® fleet ov

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- **Massive frame stamina**—with 277 lbs. of high-strength, shock-resisting steel for each rated ton of carrying capacity.
- **Springs with extra leaves** and **extra length** to cushion the payload, smooth the ride.
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98.5 work availability through one measured 12-week period is the mark set by a 10-unit "95" Payhauler fleet—high-balling rock over steep High Sierra grades, on mammoth Pool Hydro Project, for Southern California Edison Co. Such records result from reserve power, reserve frame and transmission strength, and reserve shock-resistance!

Another thirty "95" Payhaulers join Merritt-Chapman and Scott fleet!

Merritt-Chapman and Scott Corporation has added thirty more "95" Payhaulers to their Niagara Power project equipment spread. Now, the M-C and S Payhauler fleet totals 62 units—largest in the world! On St. Lawrence Seaway, huge Glen Canyon dam, and Niagara Power Project, M-C and S have proved rock-lugging, grade-beating Payhauler performance—and confirmed their satisfaction with repeat orders.

Motivation—A Management "Must"

By **R. B. Hewes**
Professor, Mineral Industries Extension, Pennsylvania State University, University Park, Pa.

OUR ATTENTION has been captivated in recent years by the promise (or threat, depending upon the point of view) of automation of machines. So far, however, machines are built and controlled by men, and will thus do no more than the men who control them want them to do. This situation will persist into the foreseeable future, and we can be sure that the men themselves will not be automated. The trend is, in fact, in the opposite direction, so that we are more and more accepting the idea that human beings do productive work in a pattern corresponding to their will to do so, or, according to the extent of their "motivation."

Let us begin by establishing our "datum line" according to Webster's New Collegiate Dictionary. We find there:

> **MOTIVATE:** To provide with a motive, to impel.

Upon looking a little further, we find:

> **MOTIVE:** That within the individual, rather than without, which incites him to action; any idea, need, emotion or organic state that prompts to an action.

We must understand, according to the above, that true motivation is a much more complex process than simply dangling the bait of an incentive before the eyes of the "motivee." If the idea, the need, or the emotion is not there, then the incentive reasonably will have no effect. Thus, motivation is the step preliminary to incentive, the preparation without which incentive cannot succeed.

To paraphrase a superintendent in a recent management development program, "By 'motivation' we mean 'How in the hell am I going to get a man to do what I want him to do, when, if left to the natural development of events, he probably won't do it.'" This is a blunt way of expressing it, but it is, nevertheless, just about the essence of human relations in industry.

Suppose that this superintendent wants from an individual close attention to a routine and repetitious job, interest in waste control, participation in a cost reduction program, or perhaps something as seemingly simple as promptness and steadiness in work attendance. All of these are related by the common characteristic of the need to be non-terminal, the superintendent wants them to start and never lag. However, if left to "natural developments," many people never even achieve a high level of performance in anything as repetitious and unspectacular as waste control or reporting for work every day, much less maintain it.

Most of us like to use direct methods that produce a positive and favorable response. We want a machine to start when we push the button, and we reject equipment or processes that require elaborate and time-consuming preparations. Thus have we obtained the self-starter for internal combustion engines to replace the spark-gas-crank method, the indoor water supply system to replace the old back-yard pump, and the gas or electric range to relieve us of the tinder-kindling-fuel combination and the resultant wait for our morning coffee. However, the industrial and social progress that has resulted from these and a myriad of other developments has had the effect of freeing us from "answering the button" ourselves. Man has become more independent in his thinking, and he no longer shapes it just to conform to what "the boss" or anyone else may think. He must be convinced; he must be made to want to think that way, and this is no "push-button" process.

How, then, can one person influence or control the behavior of another:

He can use penalty, or punishment. This is very simple; he merely sets a standard of production or conduct, and provides a suitable penalty for those who do not, or cannot, maintain that standard. Like Gilbert & Sullivan's Mikado, he lets the "punishment fit the crime." Repeated infractions draw progressively greater penalties, so that the habitual offender or the "incompetent" almost automatically is removed from the scene.

It is certainly true that we have not yet been able to entirely eliminate punishment as a control measure, but it is equally true that the management that uses it as a first and last resource, even though it may be within the framework of a union agreement, does little more than create resentment, antagonism, and the attitude or "just wait until—." The practice also develops a lot of ingenuity in avoiding punishment while still not meeting standards. This ingenuity could be better used constructively.

He can pay—but payments, as such, have a way of getting bigger without accomplishing any more. The person who is initially glad to receive extra pay for extra work all too frequently soon looks upon the first as a right and the latter as an imposition. Not only has this been shown many times in the instance of quite regular overtime, another verification is in the case of the "moonlighter", the man who undertakes a second job on a steady basis. We cannot argue with his sincerity at the beginning, but any supervisor who has experienced this with any of his men will invariably report a drop in efficiency in that individual.

Even well-planned financial incentive systems have been known to tend to fix an agreed-upon ceiling to individual effort. The fact that such ceilings are far too low when applied to the potential of the whole man, rather than just his muscles, has been proven by many dramatic examples such as the Hawthorne experiment of the Western Electric Co. and the incentive system that has been developed by the Lincoln Electric Co.

He can plead—but pleading puts the other man in the dominant position. It then becomes a matter of granting favors, and favors are expected to be returned. Management can't plead and lead. This should not be confused, however, with the very desirable courteous request. Courtesy maintains the dignity between two individuals that pleading destroys.

It is certainly true that we cannot entirely eliminate these devices, at least the first two of them, entirely. Our entire

Primer on Motivation

The Need:

". . . Machines are built and controlled by men, and will thus do no more than the men who control them want them to do."

". . . Human beings do productive work in a pattern coresponding to their will to do so, or, according to the extent of their motivation."

Terms of Reference:

"**MOTIVATE:** To provide with a motive, to impel."

"**MOTIVE:** That within the individual, rather than without, which incites him to action; any idea, need, emotion or organic state that prompts to an action."

Responsibility:

Executive management is concerned with motivation of the group, which may be satisfied by policy or broad agreements.

Immediate supervisor is concerned with motivation of the individual, which is based upon the supervisor's more intimate knowledge of experiences and desires that may set the individual apart.

Ways and Means:

Determine the motives that already exist, in preference to "creating" motives.

Realize that motives vary among individuals and change in the same individual. The need, then, is for careful application of human-relations principles.

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free enterprise system is based upon the concept of reward for achievement and corresponding penalty for nonperformance. Motivation, in practice, is really the supplying of an incentive, or the outside influence, which will appeal to the inner motive, or need. To provide the motive is much more difficult, and, generally speaking, may not be within the scope of management.

It may be possible, however, to create an interest that a man has not had before. It may also be possible to give him a sense of pride in his work and ability. This is not actually the creation of motive, but is rather guidance toward satisfaction of motives that already exist.

Some psychologists take an interesting, and not unrealistic, view of the true nature of motives. They claim that all motives are self-centered needs. Generosity, loyalty, love, self-sacrifice, and any of the other desirable facets of human nature are really channels for self-satisfaction. In other words:

The things that I do satisfy *my* needs.

The attitudes that I have are because of the way *my* needs are met.

I *work* for the satisfaction of *my* needs.

I *give* for the satisfaction of *my* needs.

This last is perhaps the most controversial. The "selfless" characteristics are really "selfish." When I give to charity it is to assuage the uncomfortable feeling I may have when I think of those who suffer from want, or it is to prevent a sense of guilt I may have if I do not give. The man who gives up a new set of golf clubs to buy his wife a birthday present; the woman who takes time from the housework that she cannot afford to help on a charity drive; the parents who scrimp and save all their lives to give their children an education; all of these are satisfying their own needs. Even martyrs, it may thus be claimed, have accepted or even sought martyrdom to satisfy an inner need for this sacrifice.

This concept may be important to us in understanding the motives of the individual. It can, perhaps, explain many actions that otherwise seem contradictory—such as the instance of the man who will loyally defend his superior or his company against outside opposition, then turn around and fight them on another issue. According to the above, he may be perfectly consistent.

Another important thing to remember about motives in the individual is that they are not static, fixed things—but are dynamic, changing according to the conditions that confront us at any given time. Man is no machine, always responding in the same way to the same push of the button. It is disconcerting, but nevertheless logical, to find that the stimulus, or incentive, that produced a desirable response last month is now met with apathy. Man is full of these "buttons", and the problem of the proper selection will always be with us; however, the response is not entirely unpredictable.

Some basic motives are common to all of us, but different ones control the behavior of different individuals according to their experiences. As these experiences change with the individual, so will they change his motives. Basically, without regard to environment, human beings are motivated by pretty much the same needs:

1. Physical needs. To keep us alive, we need food, water, protection from the elements. These are the raw needs of existence, no different from those of the lower order animals.

2. Safety, security. The concept of safety and security is largely shaped by our environment. It ranges from the protected cave of early man to the modern insurance policy. Generally speaking, when the physical needs are fairly well provided for, our thoughts turn next to the problem of maintaining the status quo. Solution may lie in individual effort, such as additional training or education, savings accounts, insurance policies, home ownership, or it may lie in group efforts like association or union membership, government action, etc.

3. Affection, belonging. Man is, for the most part, a herd animal. We want someone upon whom we can immediately bestow our affection, and who will return it to us. We also want to feel that we "belong," that we are accepted in our group or our community.

4. Opportunity to express aptitudes and abilities. People like to do those things that they do best. Furthermore, probably in direct proportion to their ability, they resent

being denied the chance to use that ability. This is not confined to doing certain specialized work within a company, e.g., production v. engineering, common labor v. skilled labor, but it can also apply to different functions within a department. One man is self-driven to leadership, another is more content to follow; one is creative, and not content with routine work, while another excels in thoroughness on an intricate but repetitive job. This is the need that is filled by what we frequently refer to as job satisfaction.

5. To feel important and worthy. This may not be job-connected, but it should be. We spend more time on our jobs than any other single function except sleeping, and the welfare of each person as well as that of the entire company depends largely upon how well each person likes and does his job. This makes each man important, and he wants the recognition that goes with that importance. If he doesn't get it voluntarily, he'll force the issue when he gets the opportunity. These needs are inherent from early childhood. As we live, we acquire more needs that are developed by our pattern of life, but most of these are merely refinements of the basic needs. To most of us, greater wealth most importantly means greater security and recognition from our fellows. In fact, the average person would reject even a considerably higher income if it necessarily entailed a proportionally greater risk or reduction of the respect of others.

Many situations thus provide incentive for two or more motives, frequently those that are in conflict with each other. These situations can lead to a feeling of frustration, and subsequent antagonism, because no decision can be reached that will satisfy both motives, or it may lead to deciding in favor of one motive, then promptly trying to get the other satisfied also.

It is extremely important that we remember that motives are not static. The same set of motives do not everlastingly govern our actions and reactions. In fact, once a motive has been satisfied and as long as it remains satisfied, it generally fades from our consciousness as being important to us. It would be pretty hard to appeal to a wealthy person with the incentive of sufficient food or adequate shelter. When business is at a high level, good pay and steady work are not the strongest incentives, since most people have them already. With these achieved, attention turns to other things. We now want a chance "to show what we can do," and recognition to accompany successful endeavor. If we don't get this in our jobs, we may find it elsewhere in community activities, sports, union membership or fraternal organizations.

It is not implied that these forgotten motives are no longer powerful. They are still powerful as ever, but they are dormant, so to speak. As conditions may retrogress, they reassume their old importance. When unemployment increases, job security and good wages once again become strong motives, and we are willing to sacrifice other needs to preserve them. If staple goods become scarce, then money and luxuries become much less valuable as incentives.

Thus, management's problem of motivation resolves into two parts: (a) motivation of a group, which may be satisfied by policy, by broad agreements or provisions that may be calculated to appeal to people in the aggregate, and based upon a recognition of developments in the immediate past, and (b) motivation of the individual, based upon the more intimate knowledge of experiences and desires that may set that person apart from the group. The first of these is obviously a responsibility of executive management, while the second will necessarily fall upon the immediate supervisor.

There is an old story about a man who was exceptionally successful in locating lost horses. When asked for his secret, he confided, "I generally just figure where I would go if I was a horse, and I look there, and there he is." Obviously, the reason other men couldn't find those horses was because they were looking where they thought horses would go, but they were thinking as men, not horses.

An illustration of the results of similarly erroneous thinking is reported in an investigation of a few years ago by the Labor Relations Institute, of Newark, N. J. They asked a large number of supervisors to rate the order of importance, to the people they supervised, of ten different employment conditions. After the supervisors opinions were tabulated, the investigators took the same list of conditions to the employees and asked them to rate their importance to themselves. The results were surprising. The supervisors had said that their employees most highly prized the conditions of Good Pay, Job Security and Promotional Opportunity, in that order. However, the employees placed these in the middle of the list, and gave first place to Appreciation of Good Work, Help on Personal Problems and Feeling In On Things. The supervisors had placed these at the very bottom of the list. Furthermore, the employees seemed to contradict an old stand-by in human relations principles in placing tactful disciplining by the supervisors in last place on their list.

This disparity becomes more readily explainable if we consider it in the light of the changing motive. We also get a pretty good picture of the conditions that prevailed in this company at the time of the investigation. Pay and employment levels were high. Furthermore, supervisors probably did criticize tactfully. As a consequence, these needs were no longer paramount, and others came into sharper focus. The supervisors were listing a standard ranking of needs; the employees were listing them as they saw them at that time. If employment fell, or management became careless of their actions and attitudes, then the employees' ratings would undoubtedly shift to closer agreement with the supervisors.

How, then, can we "motivate"? What can we tell that superintendent that will help him to achieve a willing effort from his men toward efficient operation of his plant?

First, he must realize that, in general, his function is not so much to create motives in people as it is to determine the motives that already exist, and then to supply the incentives that will appeal to them in producing the necessary response. True motives are difficult, if not impossible, to create; it is far more quickly rewarding to work toward shifting their emphasis or direction. The man who seeks expression by opposing his supervisor at every turn may be led to finding equal satisfaction through leading his fellows to outstanding performance in production or accident prevention.

Next, he must remember that, since motives vary among individuals, and change in the same individual, a standard incentive will not appeal to all people, and will not continue to motivate forever. This fact emphasizes the

importance of an intelligent and carefully conducted application of human relations principles. Group treatment, in the form of company policy and broad, general orders, while quite necessary, is not enough. Those in management who have or can make the opportunity must learn to know and understand the individual.

Under modern industrial and economic conditions, people actually need to be given a reason for wanting to work. The sole reason of keeping his job is not enough to get more than minimum performance from a man, and in very good times it may not be enough to get even that. To get the attention and the effort of the whole man, he must have other reasons, and it's management's job to supply them.

One way of doing this is to "tell them why." There is a variety of reasons and methods included here. "Telling them why" means different things to different people, and most of them are good practice. Tell them why when you give an order. Giving reasons with an order gives the other man a chance to think with you, a "must" for interest and intelligent action. Tell them why on a reprimand or correction. Show them why this is necessary, even though you may be sure that they already know it. Tell them the "why" of their whole job. This is simply the constant informative job of management to give the worker as much information about his job and the importance of good work as is possible. We don't have the time to conduct courses for individuals on the job, but we can be informed ourselves so that we can take every opportunity to explain the importance of doing things a certain way.

Don't let a barrier arise between you and your men. Between superintendent and foremen, superintendent and workers, or foremen and workers, the same possibility of failure to communicate exists. Listen to them. Hear a man out, no matter whether it's a complaint, an excuse or an idea. It may simply allow him to get things "off his chest," which is generally time-consuming but may produce a real profit later. You can't know that without listening, and while you're listening you also have the opportunity to think. It's also quite possible that you may learn something you didn't know.

Give people a sense of importance. Every man is important, and he wants to be justified in feeling that way. This is a powerful basic motive, and failure to satisfy it has often led to deep and long-held resentments. Some men need more help in achieving this feeling, and it is toward them that this suggestion applies most. Express your confidence in them, recognize effort and good work, and be interested in them personally and individually. If you can't do this sincerely—forget it.

One aid toward a feeling of importance is a competitive atmosphere. Man has always thrived on competition, with or without the incentive of immediate economic gain. Even the loser can feel a sense of accomplishment provided he gets some recognition for his effort. Intelligent supervision can generally provide recognition for all who make a real effort, so that that effort becomes much more common.

Another reason people work is to respond to good leadership from management. Management must provide this leadership, however, in a form that will gain voluntary acceptance. If you want high work standards, firmness, fairness and confidence will work far better than vacillation, weakness and favoritism. If management doesn't lead, someone else will, and it may not be in management's direction.

One thing good leadership will do is make it possible for people to work. This is one of management's chief functions. Some refer to it as "releasing the potential." Most people want to work because this, in itself, satisfies a need for them. But this attitude may be destroyed if we permit frustrations to occur. Management must constantly and unfailingly supply adequate equipment, good maintenance of that equipment, and proper supplies and raw materials at the right time, the right place and in the right condition. Lack of these things inevitably leads to frustrations, frayed tempers, and an attitude of "If the boss doesn't care, I sure don't." There is no question in my mind but that far too large a number of the management of all ranks in the coal industry have allowed themselves to come to an acceptance of down-time and breakdowns to a degree that trends toward defeatism. Admittedly, we have these troubles, and will continue to have them for a long time to come, but until we calculate the true cost of these delays and make this cost known and understood we stand to lose the benefit of a large part of the effort that is made.

In a talk before a recent management workshop, presented by the Pennsylvania State University for the coal mining industry, John N. Crichton, vice president of operations, Johnstown Coal & Coke Co., clearly stated the case for motivation by management when he said:

1. A good systems plan without human motivation will fail.

2. A mediocre systems plan with human motivation is still poor, but will probably work. People can make it work.

3. A good systems plan with human motivation is a world-beater.

It is through such management practices as these that people can be motivated to cooperate and give their best efforts willingly. Reports on industrial motivation research repeatedly emphasize the importance of the humanistic approach, rather than financial, or the purely organizational, to establish and maintain employee attitudes that produce. One important piece of research on this question showed that 80% of the successful, high-producing supervisors that were surveyed were "employee-centered", while 70% of the unsuccessful, or low-producing supervisors were "production-centered". Evidence points to the conclusion that the latter group "bore down" so heavily on production as a means as well as an end that they alienated the people who had to get that production for them.

It should not be inferred, however, that employee-centered management attains its goal by permitting free action to keep people happy. People do not produce simply because they are happy in their jobs. Management must provide coordination to make performance possible, and control, to direct that performance and keep it stable.

Motivation, then, is not a problem for the laboratory, the text-book and the research-survey, but impractical or impossible for effective application. It is a useful management tool, used far too seldom. It will produce results if it is given the benefit of objective thought, good planning, determined application and close observation.

Twin-screw diesel towboat *Humphrey*, 132' x 27' x 9'6".

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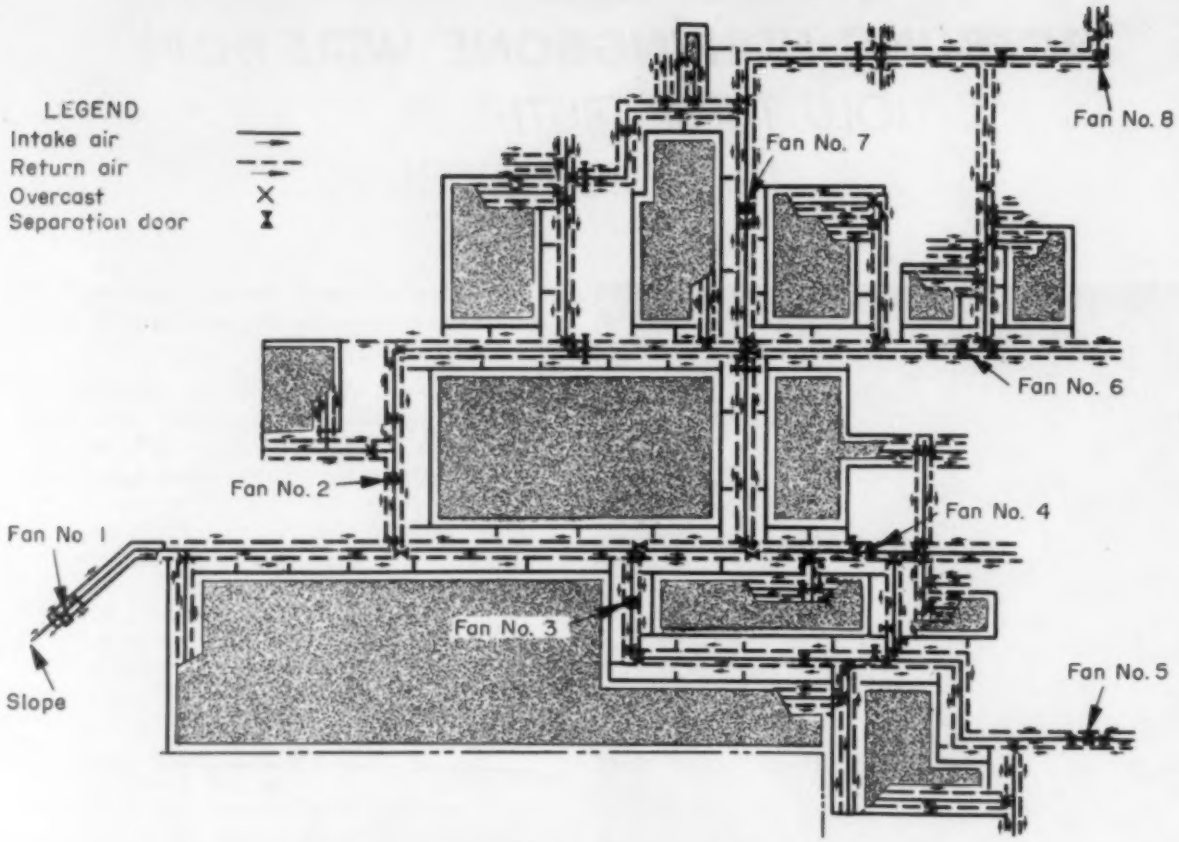

FIG. 1—NORMAL DIRECTION of air flow with eight fans operating.

Benefits and Control of Multiple-

Separation doors in main returns and self-closing doors at upcast airshafts minimize the effects of fan stoppages at Robena mine. Intakes are common to all eight main fans at this 25-sq mi property.

By **J. A. Boyle**, Chief Mine Inspector, and **O. S. Conn**, Ventilation Engineer, Frick Dist., United States Steel Corp., Uniontown, Pa.

IN THE FRICK DISTRICT of U. S. Steel Corp., we have had more than 35 yr of experience in the use of multiple-fan ventilation systems in our coal mines. In our Colonial field, with a long belt installation, we have mined 85 million tons of coal with the use of the multiple-fan system of ventilation. In our Palmer field, with the use of the same arrangement, we have mined 90 million tons of coal—a total of 175 million tons without one accident attributable to improper mine ventilation.

The same system, fundamentally, has been installed in our expanding Robena operations and at its present stage of development we are using eight fans to ventilate this area. To date we have mined 47 million tons of coal with very encouraging results and again without any accidents attributable to ventilation.

To give some idea of the magnitude of the Robena property, it can be described as having over 156 mi of main intake airways, of which 54 mi are primary haulage roads. There are 155 mi of return air courses and this does not include 55 mi of bleeder entries. To date, active workings underground subtend a surface area of 25 sq mi.

To insure ample ventilation of all active underground spaces, as well as return air courses and mined-out areas, to the extent that an accumulation of gas cannot exist, we are presently using one force fan and seven exhaust fans to produce a total volume of 2,300,000 cfm, which is 20% in excess of normal air requirements. These fans are exhausting 6 million cu ft of methane every 24 hr.

We feel that it is never super-

From a paper presented at the Coal Mining Section, National Safety Congress, Oct. 21, 1958

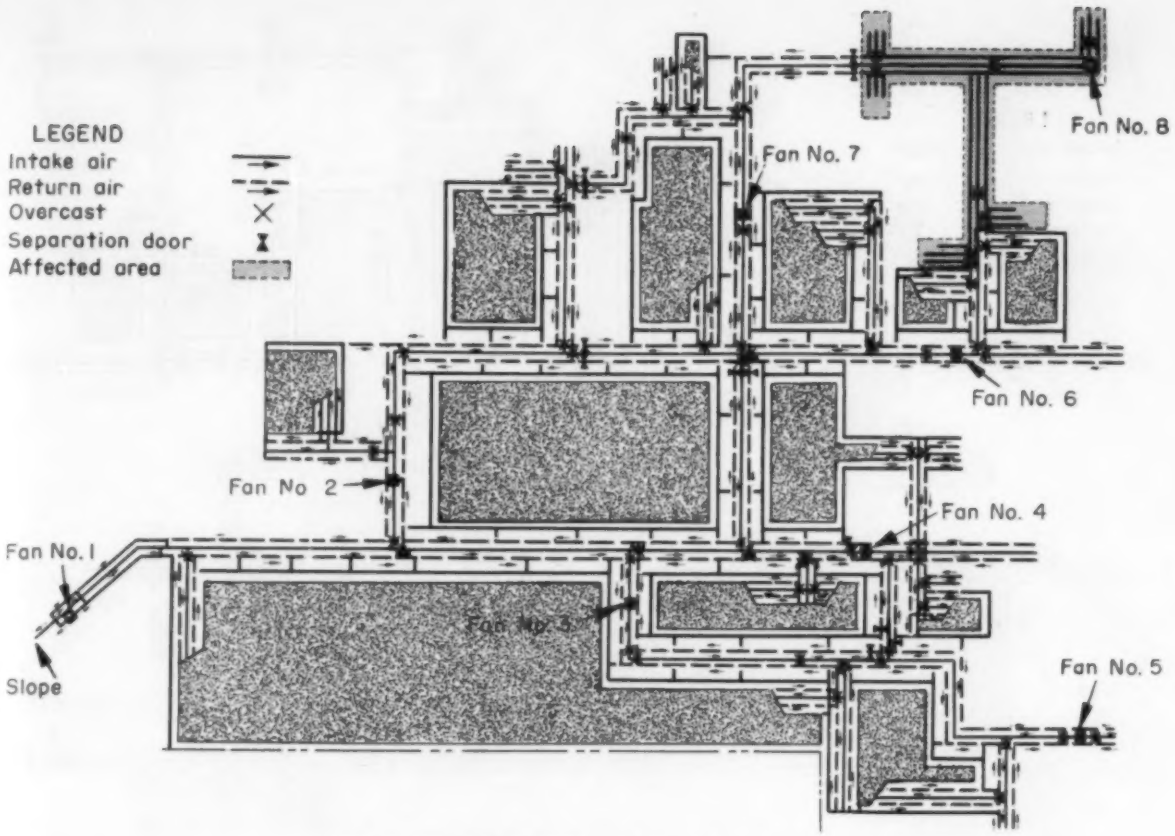

FIG. 2—AFFECTED AREA with No. 8 Fan stopped.

Fan Ventilation

fluous to point out the importance of sound, detailed plans and their vigorous execution. The ever-changing physical aspects of an active coal mine require periodic, routine, thorough ventilation studies to insure currency and accuracy of established plans to be positive that the necessary degree of control is ever present in our ventilation system. Through the years we have acquired a fund of information which has proven to be of tremendous value and service to us as operations progressed in the Robena field, and it will doubtless prove to be equally valuable in future operations in other areas.

In introducing multiple-fan ventilation in our operations, we neither sacrificed nor mitigated any of the basic ventilation standards held by us to be attributes of sound, safe mine ventilation, regardless of mine size. For example, two-split section ventilation; emergency fire door arrangements and regulators to be used in conjunction with two-split ventila-

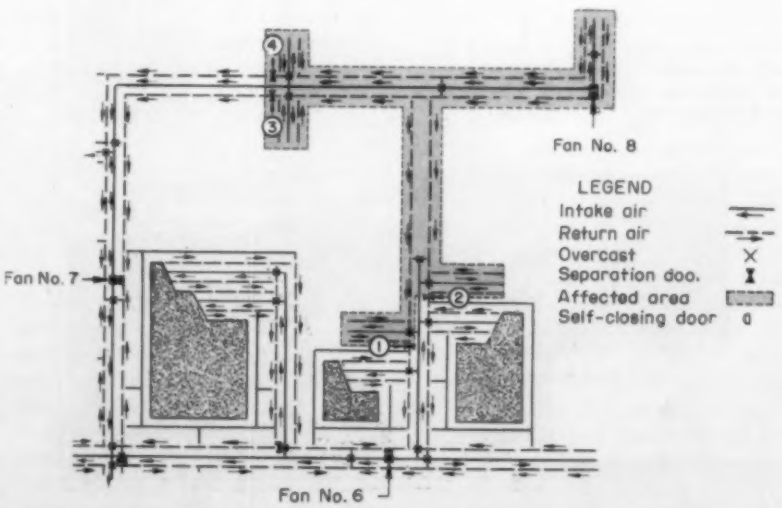

FIG. 3—DIRECTION of air (Fan No. 8 stopped) after separation doors are opened.

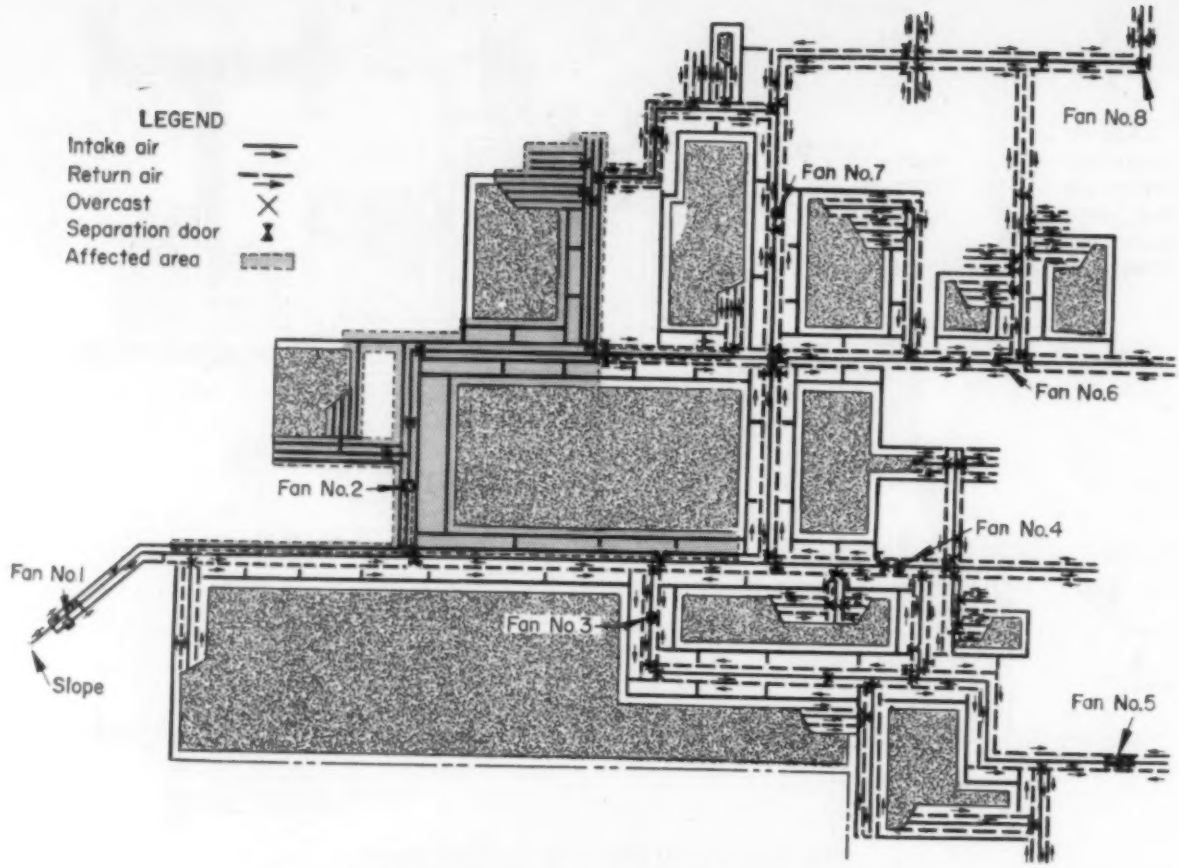

FIG. 4—AFFECTED AREA with Fan No. 2 stopped.

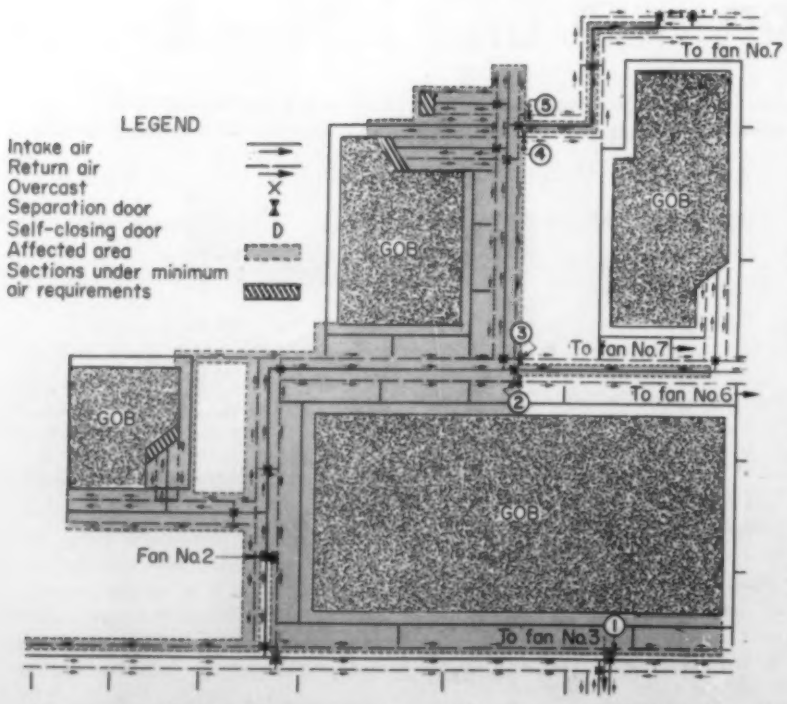

FIG. 5—DIRECTION of air (Fan No. 2 stopped) after opening separation doors.

tion to afford a smoke-free escape route in event of an emergency; a 0.5% maximum allowable methane concentration in the return of any air split; a minimum allowable air flow of 10,000 cfm on haulage roads; and so forth. We have found that multiple-fan ventilating systems have contributed generally to increased safety and flexibility in coal-mine ventilation.

Reserve Capacity

Aside from the additional safety features of multiple fan ventilation, the reserve capacity in such a system affords the opportunity, as demonstrated by our experience, to minimize the consequences of the rare but nonetheless significant occurrence of fan failure. The opinion popularly held in some quarters is that fan failure in any of the elements of a multiple fan system disrupts the entire system, or otherwise makes it unsafe and inoperable from a mining standpoint. We propose to demon-

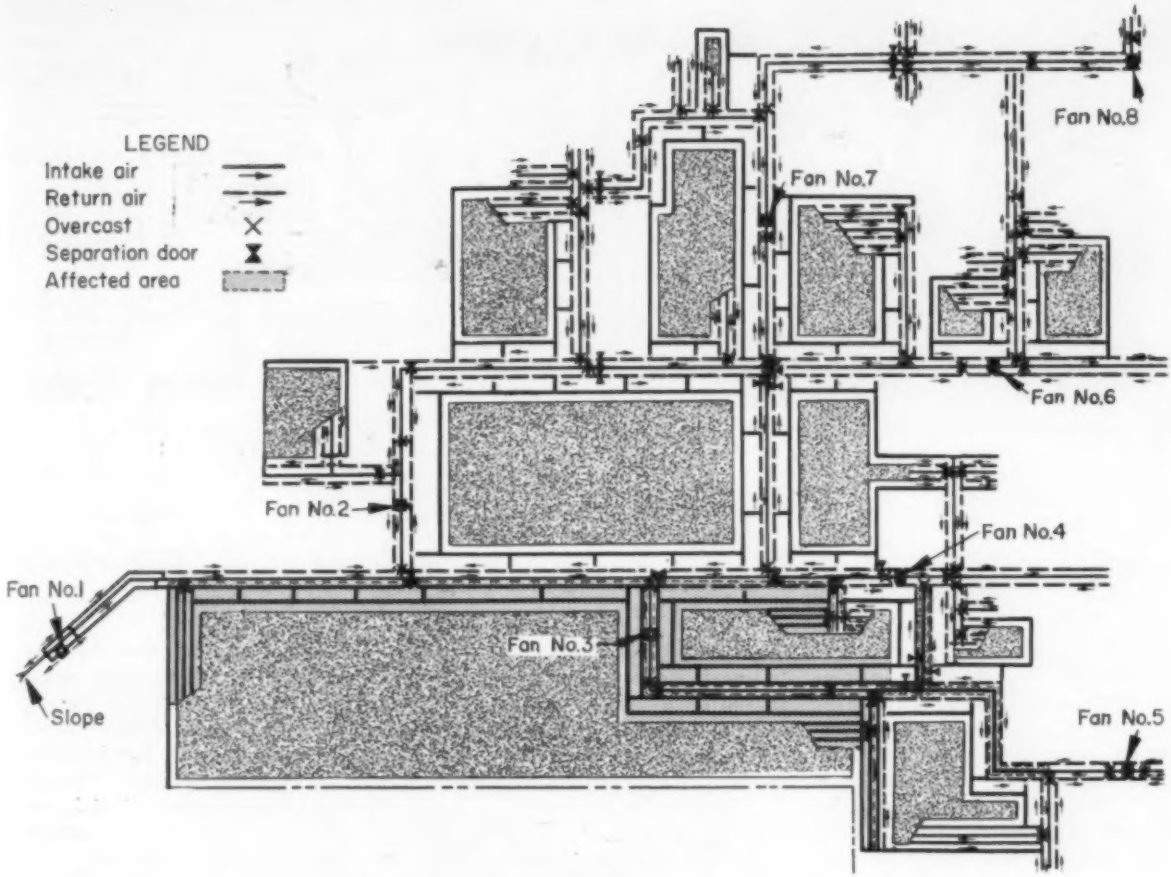

FIG. 6—AFFECTED AREA with Fan No. 3 stopped.

strate beyond the shadow of a doubt that fan failure can occur in the system and that through preplanned, methodical steps—consistent with recognized safe practices—the mine can be safely and thoroughly ventilated. Our experience has demonstrated that the necessary adjustments to restore the mine to operation can be made with safety, dispatch, and minimum discomfiture to personnel.

It should be emphasized that the operator must be in position to promptly disconnect the power from the entire mine in event of a fan failure. To best accomplish this, we utilize a supervisory control system at a central location (see *Coal Age*, October, 1955, p 68).

We have conducted numerous ventilation tests at our mines for many years to determine the safest methods to employ in event of a fan failure. We want to review with you the results of some of these tests at Robena mine, and how mine ventilation is affected.

A general ventilation print of Robena mine is shown in Fig. 1. This print shows the locations of the eight fans and the normal direction of air flow. You will note the absence of doors on the main intake airways, which causes all intakes to be common to the eight fans. However, you will note that separation doors are provided at strategic locations in the main returns to establish positively the direction of air flow to the various fans.

The location of these doors is determined by the number of sections and the desired work load for the fan ventilating the area. In addition, automatic self-closing doors are provided at the bottom of all upcast shafts to seal these shafts effectively in the event of fan failure. These will be shown in subsequent illustrations.

As a specific example, you will note the direction of air flow under the influence of No. 8 Fan. The direction of intake air is indicated by the solid arrows. The dashed arrows indicate the direction of return air flow. You will note that the governing separation doors are in the closed position.

Fan-Stoppage Effects

Tests have proved that the shaded area Fig. 2 is affected when No. 8 Fan is stopped. The tests also established the fact that the direction of the air flow was not changed in any of the other sections of the mine.

The area affected by the stopping of No. 8 fan is shown in Fig. 3. The automatic closing of the doors by air pressure at the bottom of the No. 8 return air shaft, and the manual opening of the separation doors numbered 1 through 4, resulted in the coursing of the air as shown. The direction of the intake air (solid arrows) remains the same. However, the return air from the sections now flows to Fans Nos. 6 and 7.

To provide air in quantities consistent with established company

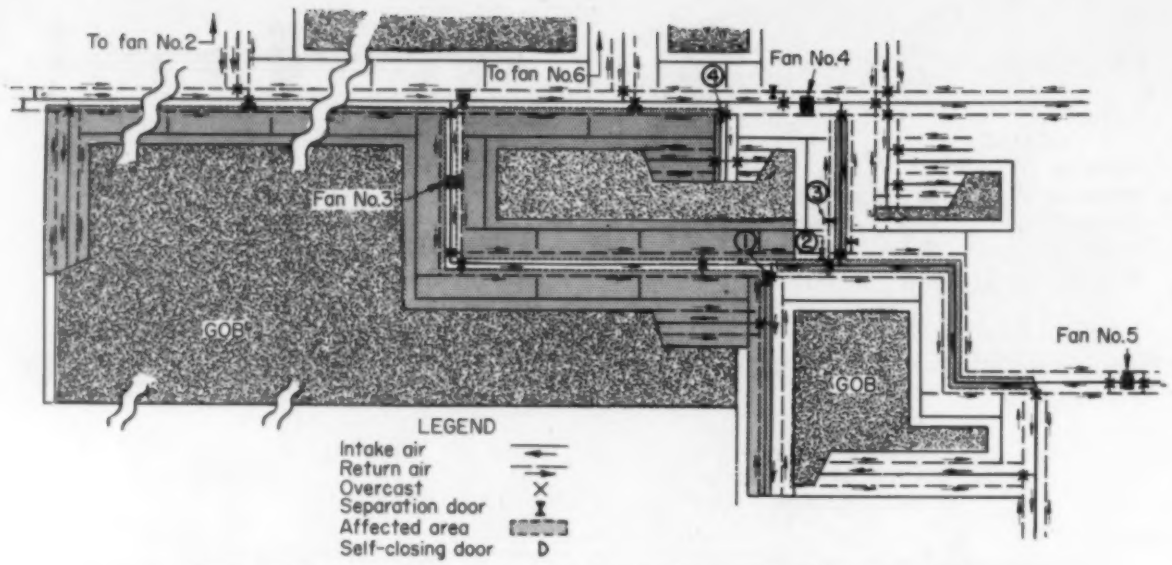

FIG. 7–DIRECTION of air (Fan No. 3 stopped) after separation doors are opened.

standards to operate the sections in the affected area after the separation doors were opened, certain adjustments were made on the regulators in other sections which were under the influence of Fans Nos. 6 and 7. This procedure resulted in the provision of ample ventilation on the main intake airways and in the sections, enabling us to operate the total mine in complete safety, notwithstanding the fact that the No. 8 Fan was out of operation.

When No. 2 Fan was stopped, tests proved that the shaded area in Fig. 4 was affected. You will note by the absence of solid arrows that the flow of air on certain haulage roads, as well as in the sections under the influence of this fan, was below our standard air requirements. Here again you will note that the direction of the flow of air on haulage roads and in the sections that were under the influence of the other operating fans was not affected by the stopping of the No. 2 Fan.

Fig. 5 on a larger scale is the area affected by the stopping of the No. 2 Fan. With the No. 2 Fan's automatic doors closed and with the manual opening of the separation doors numbered 1 through 5, the flow of intake air on the previously-mentioned haulage roads was restored to standard levels. The ventilation of the sections normally ventilated by No. 2 Fan—shown in Crosshatching in the illustration—was placed under the influence of Nos. 3, 6 and 7 Fans. The ventilation provided, however, was less than our standard requirements for producing sections. Therefore, these sections would remain inactive until operation of No. 2 Fan would be resumed.

The area affected when the No. 3 Fan was stopped is shown in the shaded area in Fig. 6. You will note by the solid arrows that the air flow on all haulage roads in the mine remained at or above our standard requirements—with the exception of the haulage roads to the extreme right of the outlined area where the solid arrows are not shown. Our tests indicated that the flow of air on these haulage roads was below our standard air requirements.

Fig. 7 shows on a larger scale the area affected by the stopping of No. 3 Fan. With No. 3 Fan's automatic doors closed and with the manual opening of the separation doors numbered 1 through 4, the flow of intake air in the previously-mentioned haulage roads was up to standard air requirements and the sections previously ventilated by No. 3 Fan were then adequately ventilated by Fans Nos. 4 and 5.

The foregoing highlights the wealth of data accrued from the many ventilation tests made at Robena. We wish to emphasize that these tests are constantly being made especially as a part of our routine fan-maintenance program. Such tests serve the purpose of keeping all information current so that for any immediate situation, we have accurate, firsthand knowledge of the direction and quantities of air available to the mine when any fan is down. The information we have obtained from these studies proves that in the event of a fan failure, it is possible to ventilate all haulages and, with very few exceptions, all producing sections adequately.

Our experience indicates that the following fundamental procedures are necessary for the successful control of mine ventilation utilizing multiple main fans:

1. The installation of self-closing doors at all return exits to prevent the reversing of the air to intake in the event of a fan failure.

2. The installation of separation doors in the return airways to establish definite direction of air flow to the various fans.

3. Periodic ventilation tests with each fan stopped to determine by actual air measurements the resultant effect on air distribution.

4. Prepared plans of action to be taken in the event of failure of any of the fans.

Having these installations, information and plans at hand enables us to exercise positive control of our mine ventilation and to effect necessary changes in a minimum of time and with a maximum of security and safety to personnel in the mine and property.

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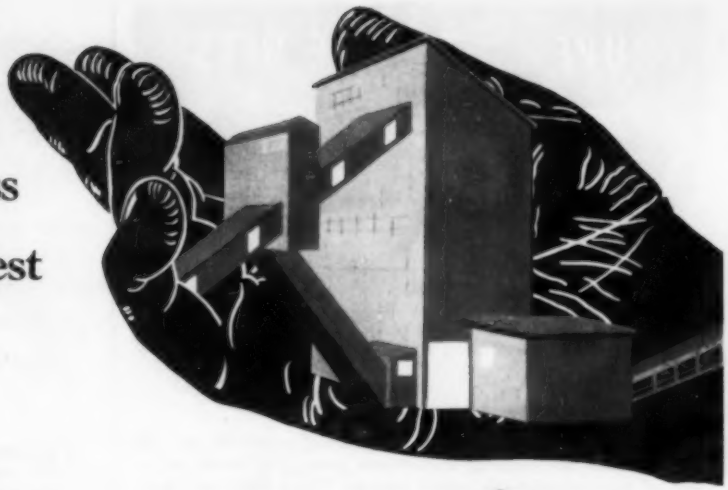

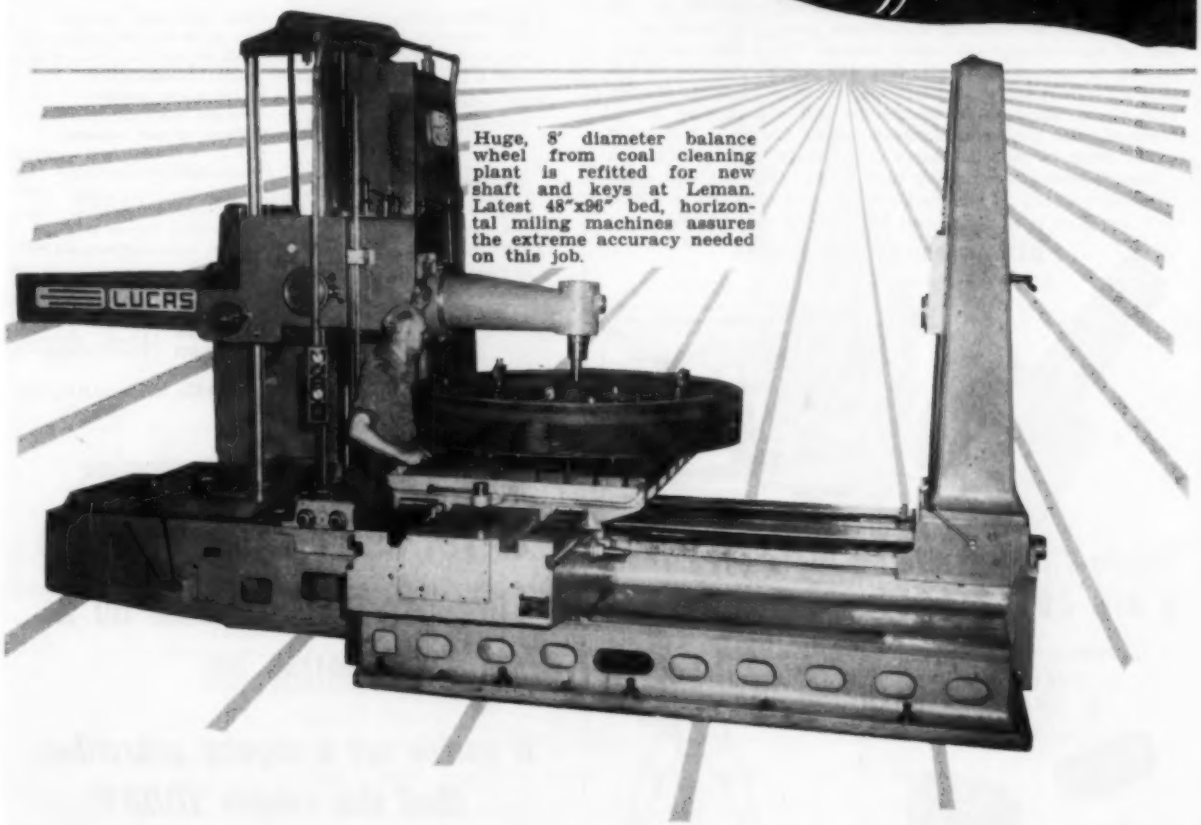

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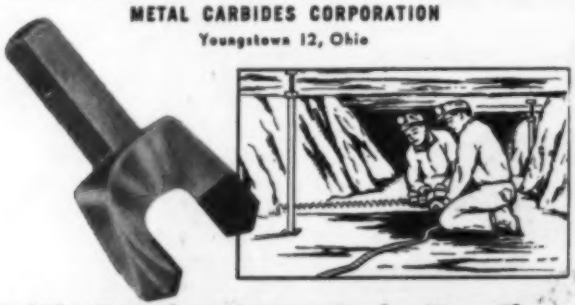

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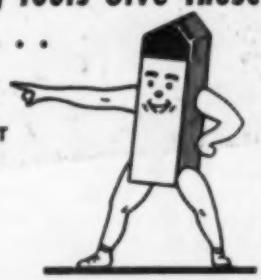

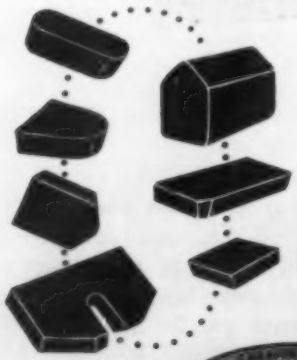

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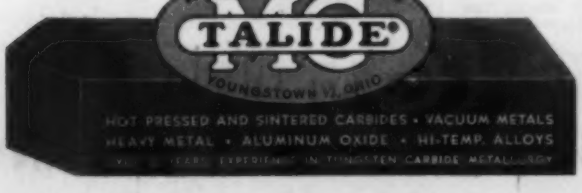
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CONVENTIONAL TAPER-LOCK DRIVE

DYNA-V TAPER-LOCK DRIVE

NEW **HIGH CAPACITY**

NEW **COMPACTNESS**

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COMPARISON, ILLUSTRATED ABOVE — 3 HP, 1750 RPM, 2.41 TO 1 RATIO

	BELTS		SHEAVES			CENTER DIS-TANCE	HP	WEIGHT (LBS.)	COST	
	Number	Size	O.D. Driver	O.D. Driven	Width				Per hp	Per Drive
CONVENTIONAL TAPER-LOCK DRIVE	3	A42S	4.15"	8.95"	2½"	12.3"	4.62	24.7	$5.91	$27.38
DYNA-V TAPER-LOCK DRIVE	2	3V400	3.35"	8.00"	1⅞"	10.8"	5.0	18.0	$4.50	$22.50
% SAVING *Savings vary with different sized drives*			19%	10%	56%	12%	+	27%	23.8%	17.8%

Dyna-V Drives are sensationally compact. They are capable of handling up to three times as much horsepower in a given space. Dyna-V opens vast new possibilities for better, more economical machine design. And, in most instances, *Dyna-V costs less!*

Narrower grooves, to match stronger, narrower Dyna-V Belts, greatly reduce the face width and the weight of Dyna-V Sheaves. Cost is lowered. Smaller diameter sheaves and shorter center distances multiply savings.

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Dyna-V Drives will be available for capacities from 1 to 1500 hp. Ask your Dodge Distributor. Or write us for new Dyna-V Bulletin.

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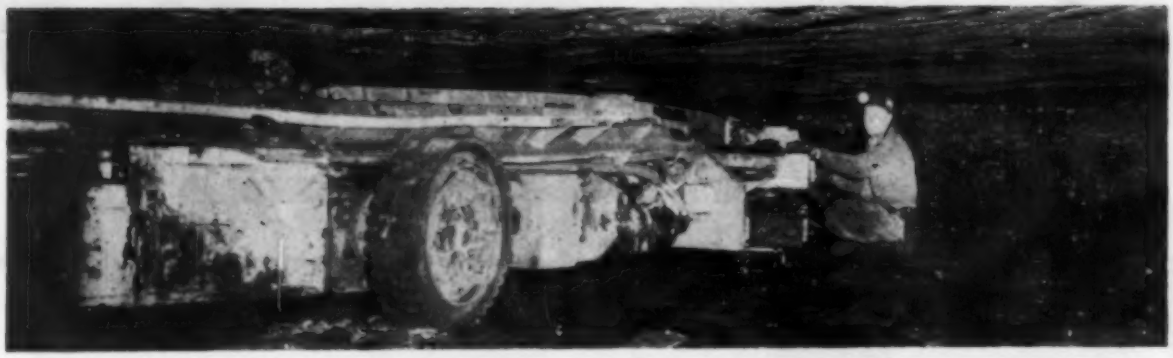


HIGH PRODUCTION EQUIPMENT teamed with good operators helps achieve an output of 24 tpm on the payroll.

RUBBER-TIRED machines cut places in 7 to 8 min. Note solid tires which reduce tire maintenance and supply cost.

NEW SHUTTLE CARS eliminate elevator previously used to transfer coal into mine cars. Shuttle-car speed is 6 mph.

High-Tonnage Punch Mining At Chafin Coal

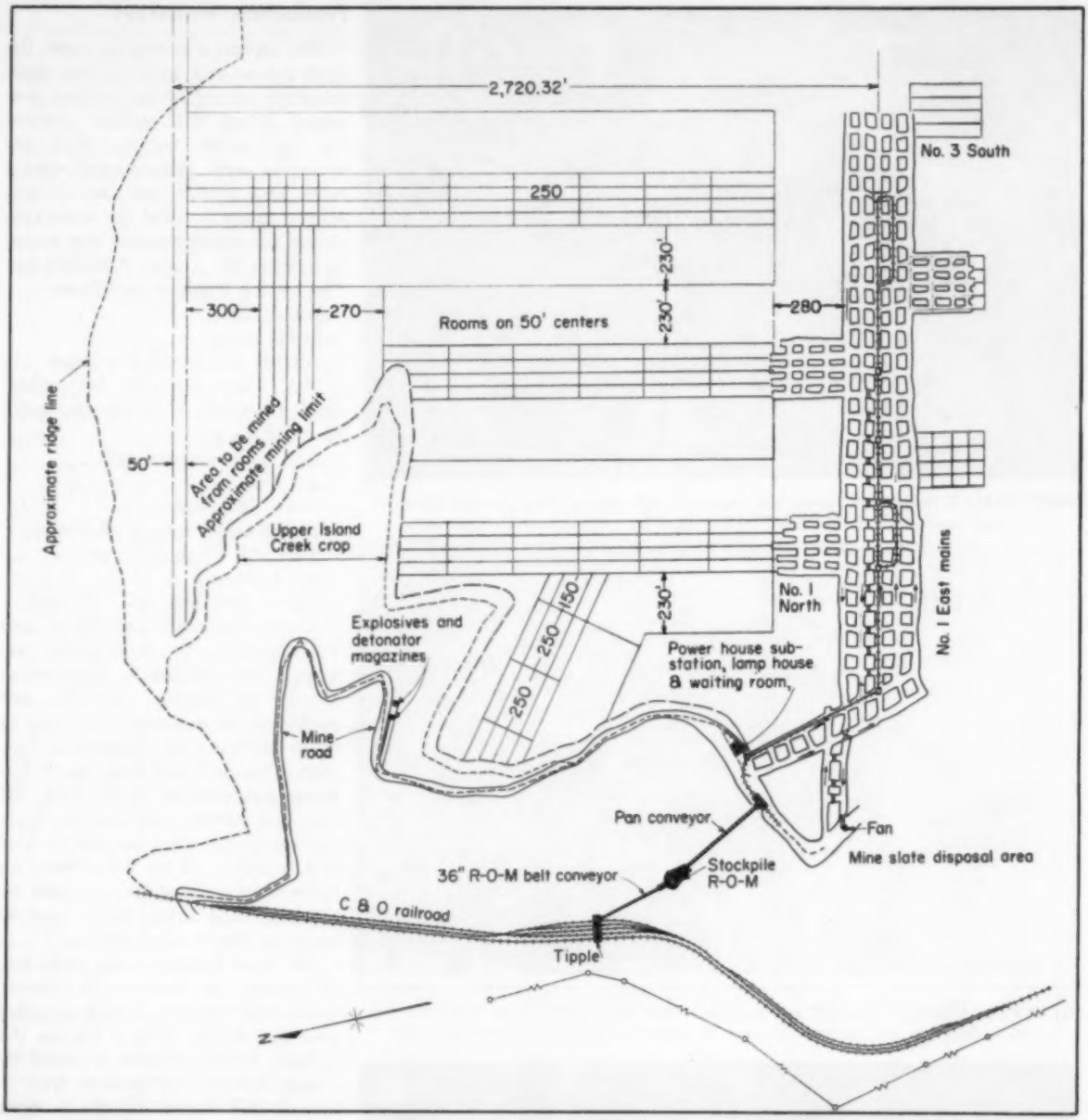
Broadening the limits of punch mining and adopting a special set of rules to regulate production, mine cost and labor have resulted in a high degree of efficiency and an increase in tons per man on the payroll at Chafin Coal Co.

TWENTY-FOUR TONS OF CLEAN COAL SHIPPED per man on the payroll is the average production at the new No. 2 mine of the Chafin Coal Co., Logan, W. Va. The system of mining is not in its strictest sense punch mining, but it has all the characteristics on a somewhat larger scale than normal. The company has established a set of rules which in effect voice management's philosophy on regulations relating to production, labor and mine cost. The rules follow:

1. Keep the operation small and compact.
2. Develop only that coal which can be mined within a 6-mo period.
3. Limit mainline haulage and power-transmission distances to approximately 7,000 ft.
4. Design and provide for overcapacity of the complete operation, including the mining plan and equipment, haulage system and preparation facilities.
5. Provide adequate maintenance facilities for mine and equipment.
6. Establish and maintain good labor relations.

Mining Property

Located in the heart of the bituminous coal region of West Virginia, the Chafin Coal Co. has an estimated reserve of 10,000,000 tons of high-quality coal in the Cedar Grove seam, plus untouched reserves in the Eagle and Powellton. Although the com-



PUNCH MINES include an area approximately 5,000 ft wide along the outcrop and 7,000 ft deep. Each mine contains about 3 million tons of coal on the solid. Panels are driven on the left side on advance work and the right side on retreat.

pany's holdings are large it finds that by limiting the size of its mines, using up-to-date conventional mining equipment and having all concerned participate in the planning and operation it can achieve a high degree of efficiency and above the average in payroll tons per man. In 1956, it led the state in this latter respect. Peak production at the No. 2 mine is expected to reach 26 tons per man when full production is reached.

Operating two shifts daily, the average production is 1,224 tons with 51 men on the payroll. This includes supervisors, electricians and mechanics, preparation crew and office personnel.

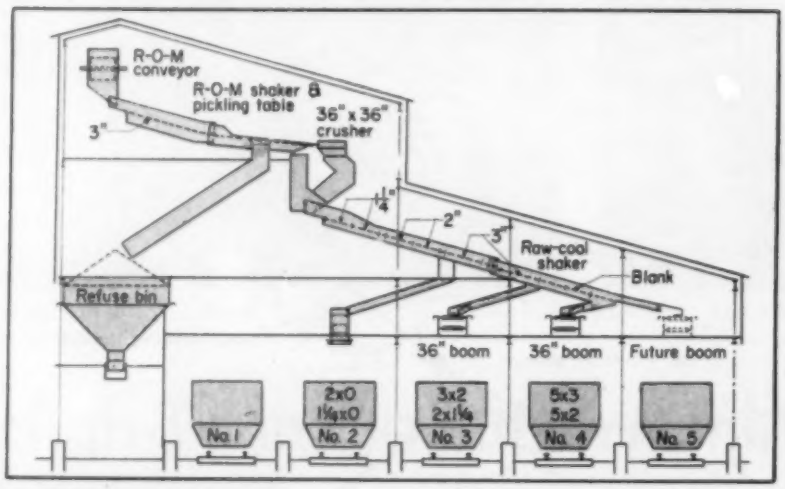
Mining is in the middle split of the Cedar Grove seam, which lies approximately 400 ft above drainage. The seam is divided into areas 5,000 ft wide along the outcrop and approximately 7,000 ft inby the outcrop. Each mine opening is 5,000 ft apart so that panel entries can be driven 2,500 ft to the right and left of the mains.

The No. 2 mine has an estimated 3 million tons on the solid and will be completely worked out before moving to the next location.

The seam averages 42 in in thickness at the present location but increases to as much as 57 in as the portals are relocated along the outcrop. The top consists of blue slate which weighs 180 lb per cubic foot. The bottom is a combination of fireclay and slate and is slightly harder than the top.

(*Continued on p 106*)

RAW COAL is transported down the mountain by a heavy-duty panline conveyor to storage area and then is taken into the plant by a 36 in rope-belt conveyor.



NEW PREPARATION PLANT was designed with overcapacity to meet future production demands, eliminate equipment overload and reduce maintenance cost.

HEADHOUSE is served by a loop track which permits loaded cars to dump into an 80-ton storage bin and return to the mine without stopping or switching cars.

Production Mainstays

One section was used to open the mine but as new territory was made available an additional section was added. These two sections account for the entire output. Both are equipped with conventional mining units. One section contains all new Jeffrey equipment and the other consists of Joy equipment that was moved from mine No. 1 after it worked out. The section lineup is as follows:

Jeffrey Unit

81AH loader.

70URB cutter with bugduster.

66A shuttle-car with four wheel drive, boom lift, 3-ton capacity and a speed of 6 mph.

A9A hydraulic coal drill.

Joy Unit

14BU 7BE loader.

11 RU cutter with bugduster.

Two 32E 15 shuttle cars.

PL11 elevator

Jeffrey A9A hydraulic coal drill.

Shuttle cars with the Jeffrey unit discharge directly into mine cars while those with the Joy unit use an elevator to transfer coal. The car-loading point is served by a loop or circle haulage track. Spotting is done with a Brown-Fayro HKL hoist. Car equipment consists of 80 ACF 2½ ton dropbottom cars 24 in high. Gathering and main haulage is done with a Jeffrey 12-ton locomotive. An 8-ton trailing locomotive is used on the trip as a safety factor and to assist in other haulage duties.

The main haulway is on 60-lb rail. At present the haulway is approximately 2,000 ft long. Coal is unloaded into an 80-ton storage bin on the surface. The headhouse is served by a loop track which permits trips to unload and return to the sections without stopping or shifting cars. This is accomplished by having two drifts —one for loads and the other for empties.

Mining Plan

The mining plan is room-and-pillar and some room pillars are not recovered. A map of the mine is shown in the accompanying illustration. Headings are driven 22 ft wide on 60-ft centers. Breakthroughs are on 80-ft centers. As stated previously, no coal is developed that cannot be mined within 6 mo. Therefore, when the mains are driven far enough in advance, i.e., permitting several panel

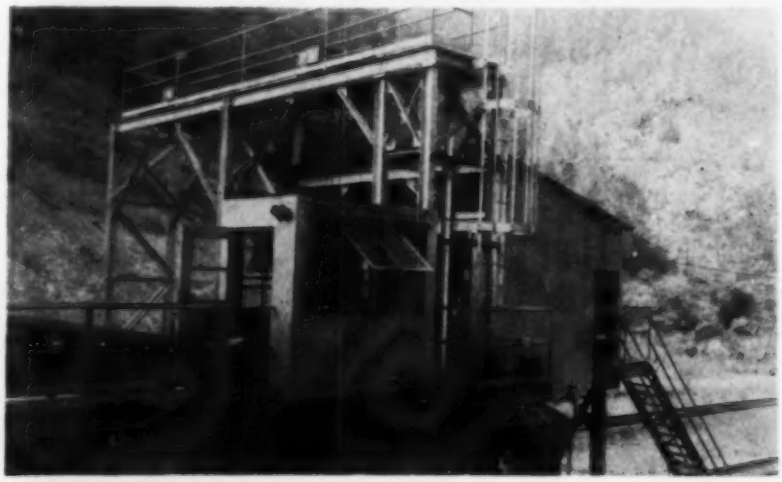
entries to be turned, the unit drops back and drives entries on the left side of the mine.

General practice is to mine the left side advancing and the right side retreating. Panels are 660 ft apart at 90 deg with the mains and approximately 2,500 ft deep. These entries are on 50-ft centers with breakthroughs every 80 ft. Rooms are 230 ft deep and 24 ft wide up to the first breakthrough. From here the room width increases to 30 ft and gradually flares out to a maximum of 40 ft as the rooms approach the 230-ft limit. Rooms are mined alternately on the right and left as panel entries retreat and pillars are pulled when possible. The only pillars taken are those mined when the unit is pulling out of the panel to move to a new setup.

When both sections are working in panel entries the section nearest the outside is always ahead of the inby section. For example, if the outby section has advanced to 1,250 ft, the inby section has started driving a new panel. Again, if the outby section has driven 2,500 ft the inby section has driven about 1,250 ft in. Oscar Damron, superintendent, notes that it is difficult to keep the sections in proper advancing stages but by doing so it keeps weight from shifting over onto either section, thus minimizing roof trouble.

When panel work is brought up to date, one unit moves back into the mains to develop additional territory for turning panel entries.

ROPE-BELT CONVEYOR transfers raw coal from storage to plant for processing.



CENTRAL CONTROL STATION, operated by one man, controls plant operation.

Section Performance

Nine men including the foreman, comprise a section crew, as follows:

Loading-machine operator.
Cutting-machine operator.
Two shuttle-car operators.
Driller and shotfirer.
Timberman.
Boomman.
Supervisor.

With a balanced work cycle, the machine crew cuts an average of 18 places per shift. It takes 7 to 8 min to cut a place. After the machine sumps up and starts cutting across the face the driller begins drilling holes. Five holes are drilled in each place with a hydraulic drill operated off of the cutting machine. Holes are completed about the same time the cutter is ready to move to the next place. While the machine is moving to the next place, the shotfirer loads the holes and shoots the coal. Three sticks of 1⅜x7-in King powder and one multiple blasting cap are used in each hole.

Each cut contains approximately 10 shuttle cars of coal. Cars in the Jeffrey section discharge directly into mine cars. Top is taken at each loading point to permit the shuttle-car booms to raise as it approaches the discharge point. The area of top taken is approximately 20 ft long and 10 ft wide with the height tapering from 0 to 30 in along the 20-ft length.

Top conditions are good. Roof support is provided by posts except in a few areas where cross bars are needed.

All equipment maintenance work is done on the third shift by two mechanics. General mine maintenance, such as, repairing track, scaling roof, rock-dusting, etc., is done by three men on the third shift. Two mechanics on the day shift repair and rebuild equipment. They also trouble-shoot when necessary.

DC at 275 v for underground operations is supplied by a 300-kw Westinghouse rotary converter installed on the outside. A 150-kw Westinghouse converter also is located in the same building for emergencies. The positive and negative feeders consist of 1,475,000-CM aluminum cables which are equivalent to 1,000,000 CM of copper. Both positive and negative feeders are mounted on in-

"A VERY EFFICIENT CRUSHER; *requires a minimum amount of maintenance.*"

A Midwest Power Plant engineer made this comment and gave the information below about the operation of their American AC 3-E Rolling Ring Coal Crusher.

Total Tonnage Reduced	Over 4,000,000 tons
Feed	20% Nut (3" x 1½") 80% Screenings (1½")
End Product	Minus ½"

Performance reports like this are standard on American Crushers. Each crusher is custom-built to suit your requirements. The American performs as an efficient crusher, producing high tonnage at slow operating speeds — saving power and maintenance. The manganese steel shredder rings are reversible for double life, crushing chambers have renewable liners, and housings are sectional for easy accessibility to rotor, and machined for a dust-tight fit. These, and many other features have been developed throughout 50 years of experience.

Our engineers will analyze your reduction problems and make recommendations of the correct size and type of crusher. No obligation, of course. Write for literature, stating your tonnage requirements.

"When you figure costs—the best results come from American Rolling Ring Coal Crushers"

American PULVERIZER COMPANY

MANUFACTURERS AND MANUFACTURERS OF ROLL CRUSHERS AND PULVERIZERS

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sulators 20 ft apart. The high-voltage supply to the DC substation is 12,000 V. This higher voltage was selected so that sufficient power would be available to mine coal at the extreme end of the property. If a lower voltage had been selected the voltage drop would have been too great as transmission distance increased.

Preparation

The preparation plant, on the Chesapeake & Ohio Ry. and built by McNally-Pittsburgh, is capable of handling 350 tph but normally operates at 300. The 50 tph overcapacity was included in the plant design. Equipped with a central control station and emergency pushbuttons at strategic locations, a minimum of three men are required to service and operate the entire plant. It is operated one shift daily and processes coal from both shifts in 7¼ hr.

Coal from the 80-ton storage bin at the headhouse is fed onto a Long heavy-duty panline conveyor which takes the coal down the mountain at a rate of 3 tpm, but can be increased to 8 tpm. Coal is stored on the surface and picked up by a Hoe reciprocating feeder located under the storage area. A Long LO-Rope conveyor takes the coal to the upper part of the plant and discharges it onto the primary shaker. Slate and foreign material are removed and taken to a refuse bin from which it is hauled away by trucks. Plus 3 in from the primary shaker goes to a secondary shaker where it is combined with minus 3 in from the primary unit. Three sizes are made on the secondary shaker screens: 5x2 egg; 2x1¼ nut; and 2x0 and 1¼x0 slack. Other sizes can be made to meet customers' demands. The plant also has facilities for oil-treating.

The company, with main offices in Huntington, W. Va., is owned and operated by four brothers: Arthur Chafin, president; William A. Chafin, vice president; John Chafin, treasurer; and M. R. Chafin, secretary. Their philosophy, which is set forth in the six rules at the beginning of this feature, is shared by each member. As William Chafin sums it up: "We find that our company operates very economically by following the rules which we have adopted. With a comparatively low overhead and a high production rate of 24 tons per man on the payroll our position in the competitive market is good."

"I call Bethlehem, when I need track bolts fast. They carry a wide variety of sizes in stock, ready to go at a moment's notice."

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

COAL BY WIRE—R. G. MacDonald, vice president, West Penn Power Co.

POWER CONTROL—W. Kegel, master mechanic, Jones & Laughlin Steel Corp.

REMOTE CONTROL—A. W. Calder, Joy Mfg. Co., and W. E. Hess (rear), J&L.

Coal Mining Institute of America probes industry's outlook on . . .

Safety, Operations, Sales

Effective control of outlying fans and ventilation circuits, remote control for continuous mining, automation of haulage and developments in safety are themes of technical sessions at CMIA's 72nd annual meeting.

AUTOMATION, including the possibilities and actualities of remote continuous mining, the sterling performance of a long-distance pipeline for product shipment and prospects for "manless" haulage, was the subject of a full technical session at the 72nd annual meeting of the Coal Mining Institute of America at Pittsburgh, Pa., Dec. 11-12. Other sessions were devoted to the surging interest in residential and commercial heating by electricity, automatic control of ventilation and various aspects of safety. More than 650 members and friends of CMIA, the oldest active mining institute in America, attended the annual banquet on Thursday evening to hear the principal speaker, Judge Max De Berry, Third Judicial Circuit of West Virginia, Harrisville, W. Va. Officers for 1959, elected at the business meeting at the opening session, are shown in an accompanying panel.

In his president's address, also at the opening session, D. C. Jones, director, Mineral Industries Extension, Pennsylvania State University, and 1958 president of CMIA, traced the history of the interests and growth of the institute since its founding in 1887. On the matter of conditions now prevalent in the coal-mining industry, Mr. Jones pointed out that in spite of the recent recession the coal industry is in healthy condition. This results from the fact that the fortunes of coal now follow the pattern of industrial production rather than the swings of the steel industry. This new trend is due to the greater use of coal by public utilities, the biggest single customer for coal, wherein the swings in general industry become more important.

Coal mining will be greatly affected by the new trend since more coal will be sold at minimum prices, requiring the development of machines capable of mining coal in greater quantity and at lower cost than ever before. However, increasing sales to utilities usually means steadier mine operation.

With regard to the shortage of aspirants for supervisory positions, Mr. Jones said that such situations should be handled locally at first. There always are young men of ambition who should be encouraged to study and prepare themselves for state certification. Universities and other agencies are prepared to help in this training or in retraining of present supervisors.

Reporting for the institute's technical training committee, Chairman J. W. Hunt, supervisor, mining extension, Penn State, said that upon recommendation of the committee the Board of Directors had appropriated $600.00 for the preparation of a television kinescope on mining engineering education to be offered to local television stations.

INDUSTRY MEETING
A Special COAL AGE
Staff-Written Report

Abstracts of the technical papers presented at the two-day meeting are as follows:

Coal by Wire, by R. G. MacDonald, vice president—marketing, West Penn Power Co., Cabin Hill, Greensburg, Pa.

Industrial markets for electric heating are centered largely in the steel industry, where energy consumption is about 175 kwh per ton of steel produced. If all the heating now done by oil and gas, such as in soaking pits and annealing ovens, was done by electricity, power consumption would increase to 800-900 kwh per ton of steel produced. The glass industry also presents a challenge to salesmen of electric power. Electricity is now used for mechanical loads but not for thermal loads, such as melting and annealing. Energy requirements for the mechanical load in the glass industry are only about 20% of the total energy requirement. The thermal load, served mainly by oil and gas, is the target.

In the commercial market, there are tremendous opportunities in electric heating—for motels, hospitals, bowling alleys, offices, churches and, last but not least, schools. The surface has scarcely been scratched in this market.

"Coal by wire" for house heating is on its way. At the end of 1957, 880,000 homes were electrically heated. By 1960 there will be 1 million electrically

AUTOMATED HAULAGE – William Barnard, Christopher Coal Co.

MATERIALS TESTING–C. T. Holland, Virginia Polytechnic Institute.

heated homes. By 1970 electric heating will be found in 40% of the new homes being built. Residential heating with electricity will require more than 70 billion kwh annually.

A *Coal Age* feature on electric heating appears in this issue, beginning on p 70.

Control of Mine Ventilation Utilizing Multiple Main Fans, by J. A. Boyle, chief mine inspector, and O. S. Conn, ventilation engineer, Frick Dist., U. S. Steel Corp., Uniontownw, Pa.

The full text and illustrations of the paper presented by Messrs. Boyle and Conn appear in this issue beginning on p 96.

Methods of Controlling Power Entering Large Coal Mines in Case of Fan Failure Where Unmanned, Separated Substations Are Involved, by W. G. Kegel, general master mechanic, Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp., California, Pa.

Continuous attendance at a fan station costs about $500 per week for labor. Therefore, if the attendant cannot be provided with other necessary work, the idea of continuous attendance is not acceptable. J&L has experimented with and employed a number of systems for monitoring outlying stations, including fans, rectifiers and so on. These systems include the use of telephone lines to carry signals, and single-wire systems to operate indicating relays. Now J&L has decided to install a circuit-scanning system. The system employs relays and is better understood by a maintenance man who has serviced controllers and other well-known types of substation equipment. Circuit scanning requires two wires to every station. A direct pulse of DC current is used to operate any control or send back any signal to the control station, which is located at the main portal and attended by the lamphouse employees.

Synchronized AC motors drive a rotary switch which checks up to 18 functions in 2 min. The decision to standardize on this system is based upon the following:

1. Circuit-scanning simulates the old reliable method of two-wire direct voltage operation of any control or indication;

2. Its circuits are more readily understood by our people, and the 175-V, DC, current should not interfere with any other control;

3. Since it is an underground system, two ground faults are necessary before the operation of the unit is affected.

The near future will bring many new methods and principles into use in the mining industry. Constant monitoring of air at the face for methane content will become a reality, remote control of mining machines is even now being used and electronic programming of operations of mining machines also will come about. These things will prove their worth, but they must certainly be evaluated by the ease with which they can be maintained.

Experimental Roof Infusion at Green Valley Mine, by A. G. Gossard, vice president and general manager, Snow Hill Coal Corp., Terre Haute, Ind.

Roof in Green Valley mine has major cleat joints forming an angle of 19 deg with vertical. Thus when the coal is removed a weak cantilever beam is formed since carbonaceous material at the bedding planes permits horizontal slippage. It was thought that binding the slick sides of the cleat joints would prevent vertical slippage. Three injection holes were drilled from the surface toward the coal which lies under from 550 to 600 ft of overburden. The first hole was drilled over solid coal at a point 110 ft from the underground working face. A fissure was intersected at a point 31 ft above the coal, causing loss of the drilling water. First Aqua Gel and then lumnite were pumped into the hole in an attempt to reseal the drilling operation. However, these materials traveled the major cleat and effective sealing was not accomplished. Higher infusion pressures were planned for succeeding holes, using compressed air from the mine circuit as the infusion medium. Apparently the higher pressure backed up gas, and there was danger of flooding the strata.

Adhesives – polyester resins – were employed at a third hole in the final experiment. It was difficult to evaluate results of the tests, except to point out that there were no falls in any of the immediate drill hole locations. Elsewhere in the same section there have been several falls. The roof had not been cored to determine the distribution of the adhesive materials. It is felt that the method employed, even though expensive, has possibilities for use in roof with weak horizontal bedding planes. It appears necessary to confine the adhesive to a small vertical section and to have complete control of this area of infusion.

Investigation of Material Used for Stopping Construction, by Charles T. Holland, head, Dept. of Mining Engineering, Virginia Polytechnic Institute, Blacksburg, Va., and Leonard Sargeant ventilation engineer, Pocahontas Fuel Co., Pocahontas, Va.

Investigations point to the following conclusions:

1. Cinder blocks, red-dog blocks and shale bricks have adequate structural strength for stoppings.

2. Porosity of stopping materials bears little relation to leakage performance, although strength may vary inversely with porosity.

3. Leakage through mortar-laid, unplastered and unpainted stoppings varies approximately directly with permeability of the material. For this reason, permeability tests may be of value in selecting materials for stoppings.

4. If stoppings are plastered the material of which they are constructed has little effect upon their leakage.

5. Blocks in mortar-laid stopping will perform as well if painted as if plastered. In plastering or painting the quality of workmanship is important in minimizing leakage.

6. Great variation in permeability and leakage exists in the many kinds of blocks on the market. Much ventilation leakage can be traced to blocks of high permeability, and for this reason care should be exercised in their purchase.

7. Pressure differential on stoppings should be varied as little as possible. This is especially true of stoppings constructed of dry-stacked and plastered materials.

INSTITUTE BUSINESS—J. M. Lowe (left), Emerald Coal, secretary; D. C. Jones, Penn State, retiring CMIA president, and J. W. Hunt, Penn State, chairman of training committee.

SAFETY—Ewalt Herzog (left), Hanna Coal Co.; J. M. Black, Pa. Dept. of Mines & Mineral Industries; A. J. Barry, U. S. Bureau of Mines, and W. D. Walker, USBM, session chairman.

8. There is considerable variation in the characteristics of a given manufacturer's product. Standards should be set up and a testing program designed to insure uniformity of the materials.

Remote Control of Continuous Mining Machines, by Gerald Von Stroh, director, Mining Development Committee, Bituminous Coal Research, Inc., Huntington, W. Va.

Capabilities of some modern mining machines are now outrunning human responses, creating a need for automation as contrasted with remote control. However, remote control is a forerunner of automation.

An automatic pilot for a mining machine might cost in the neighborhood of $40 thousand. An additional 10,000 tons of coal per yr would be required from that machine to support this cost. These factors must be taken into account in considering the trend toward automation. One of the requirements for automation of a continuous machine is some device which has the ability to sense the difference between coal and rock and to relay this information to the control center or to trigger the required compensations in operations. Such cells, designed to measure relative conductivity and to operate on the difference are available.

Remote Control of Continuous Miners, by A. W. Calder, manager, Loader and Continuous Miner Dept., Joy Mfg. Co., Franklin, Pa.

The eventual goal of remote control for continuous mining machines is to have the operator stationed in a safe, pleasant area, possible several thousand feet from the machine. Sensing devices on the machine would transmit signals to the operator to allow him to steer the machine through the coal seam.

The development of this type of remote control system has been carried out by Union Carbide Olefins Co., a division of Union Carbide Corp., with the successful operation of several machines working along a highwall. It was recently announced by Union Carbide and Joy Mfg. Co. that Joy would have these machines in general production within the next 18 mo to 2 yr, with the possibility that the sensing devices and remote controls could be adapted to underground continuous miners in the next 5 to 10 yr. In the meantime, development work has been carried out on a less elaborate and more immediate remote control system which requires an operator to be within 50 or 100 ft of the machine to guide it visually or audibly.

To utilize the full capacity of today's mining machines, it is desirable to have the operator work from several different positions. This provides greater safety in making turns, in operating in narrow places or in pillaring. In such instances, the operator could remain under supported roof 50 ft from the machine. The requirements of an acceptable system dictate that the control box be small, lightweight and simple to operate, and that dependable hydraulic and electrical circuits, unaffected by stray currents, be employed.

The Joy system utilizes small low-voltage switches on the remote control panel to actuate relay-pilot valve combinations at the machine. The pilot valves operate the main valves. The system is permissible and intrinsically safe.

A boring-type miner equipped with this unit has been in operation in a New York salt mine since Oct. 1. Experience to date shows the control to be practical.

Remote control for a full-face miner is relatively simple to devise compared to those required for a ripper-type machine. On a ripper-type unit there is need for automatic cycling of the ripper bar and automatic indexing throughout the cycle.

Transportation of Coal by Pipeline, V. D. Hanson, chief mechanical engineer, Pittsburgh Coal Co., Library, Pa.

The 108-mi coal pipeline from Georgetown Preparation Plant of Hanna Coal Co., at Cadiz, Ohio, to the plant of the Cleveland Electric Illuminating Co. at Eastlake now is transporting 165 tph for 24 hr per day at a decided economic advantage. This installation, which represents a total investment of $13 million, could be the prelude to a network of pipelines for transporting solids. More than a million tons have passed through the line to date.

The coal is prepared in a special plant at Georgetown to a size consist of minus 14M and is prepared for the pumps in a slurry with water containing 50% solids by weight. Size consist is critical, necessitating a constant watch over screening and crushing performance. The plant at the feed end requires 4,515 hp, connected load, to place the slurry past the initial pumps. Crushing alone requires 1,600 hp.

Screen studies are a constant pursuit at the plant. Stainless-steel screens now are used which have a useful life of 2,000 hr. Two intermediate booster pumping stations move the stream toward Eastlake. All three pumping stations are balanced with respect to the effects of grade and distance.

At the Eastlake terminus the coal is dewatered and transported to the power plant bunkers or storage area. The water, devoid of solids, is discharged into Lake Erie.

Automation of Mine Haulage, by John G. Kneiling, associate, Theodore J. Kauffeld, Consulting Engineer, New York, N. Y.

The movement of coal by rail in cars offers considerable economy when the haulage system is controlled automatically. Automation of such movement must be designed specifically for each installation, and the functions of face

ROOF BONDING—J. D. Reilly (left), Hanna Coal Co. and CMIA president-elect, and A. G. Gossard, Snow Hill Coal.

1959 Officers of CMIA

President—**J. D. Reilly,** vice president, Hanna Coal Co., Cadiz, Ohio.

1st Vice President—**W. E. Hess,** manager of mines, Vesta-Shannopin Div., Jones & Laughlin Steel Corp., California, Pa.

2nd Vice President—**W. D. Walker Jr.,** district supervisor—health & safety, Dist. B., U.S. Bureau of Mines, Pittsburgh, Pa.

3rd Vice President—**J. F. Core,** vice president, operations—coal, U. S. Steel Corp., Pittsburgh, Pa.

Secretary-Treasurer—**J. M. Lowe,** chief accountant, Emerald Coal & Coke Co., Pittsburgh.

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D. H. Davis, Mathies Coal Co.

G. W. McCaa, Hanna Coal Co.

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Alex Grant, Buckeye Coal Co.

H. R. Johnson, Mine Safety Appliances Co.

J. S. Whittaker, Pittsburgh Coal Co.

transportation, mainline transportation and preparation must be correlated to provide an economical system. Carload quantities can be identified, and classification, accounting and similar functions can be automatically performed.

Automation of Mine Haulage, by William O. Barnard, general superintendent, Christopher Coal Co., Div. of Consolidation Coal Co., Osage, W. Va.

Most progress and advancement has been made in face production, resulting in more tons per man and better section costs. Similar study and development is required in material handling, which, after all, is the industry's primary business. One step toward automation of this phase of operations at Arkwright mine of Christopher Coal Co. has been the successful application and operation of an automatic brakecar.

The problem at Arkwright boiled down to the need for a positive drag to prevent runaway trips. Trips consist of 30 10-ton mine cars hauled by single 50-ton locomotives. The germ of a solution was noticed in an advertisement of Sanford-Day Iron Works, announcing the availability of the S-D Brakeman car. The unit employed magnetic shoes to contact the rail to provide braking action.

The first S-D unit provided six magnetic shoes energized by a 36-V battery. The car was modified by the addition of more weight at both ends, and changes in the running gear to add flexibility.

The next car was an 8-wheel unit carrying six magnetic shoes, four of which are suspended in the trucks to give more positive action on curves and switches. Battery size was increased; now any three shoes will stop a 30-car trip. Two centrifugal switches, which control power to the magnets, are set at slightly different speeds to provide a safety factor. The car will hold a trip on a 2.3% grade for 30 min. The new larger batteries are changed once a week, and no charging arrangement is provided on the car itself.

The use of the cars enables two motormen in 50-ton mainline locomotives to haul 4,800 tons of coal a distance of 7 mi., one way, in a shift.

Contribution of Roof Bolting to Mine Safety, by A. J. Barry, mining methods research engineer, and R. D. Joseph, mining health and safety engineer, U. S. Bureau of Mines, Pittsburgh, Pa.

During the past decade roof-fall fatal accidents have decreased from 429 in 1948 to 197 in 1957. Plotting millions of tons of coal produced and hundreds of roof-fall fatals against time, it can be seen that roof-fall fatals generally follow the rises and falls in production, but the gap between the two curves constantly widens in favor of increased safety.

In further presenting the case of the roof bolt v. the roof-fall hazard, it is important to note that in 1957 roof-fall fatals occurred in 180 mines. These mines represent 2.15% of all bituminous mines in the nation. Therefore, 98% of the bituminous industry is successfully producing coal without roof-fall fatalities.

Further contributions to safety are expected of roof bolts. Research in progress is conducted to develop better bolting materials and equipment; better bolting patterns and anchoring devices are being designed, and new devices now in service or being developed aid in measuring the efficiency of installed bolts.

Teamwork Necessary for Safety and Efficiency in Coal Mines, by J. M. Black, mine inspector, Pennsylvania Dept. of Mines and Mineral Industries, Uniontown, Pa.

Causes of all mine accidents can be divided into two general classes: (1) those accidents resulting from dangerous conditions and (2) accidents resulting from dangerous practices. The bulk of the criticism of mines is against the dangerous conditions. The bulk of reported accidents are caused by dangerous practices. Officials can see dangerous conditions and take corrective measures, but they seldom see dangerous practices because the men refrain from these practices in the presence of officials or inspectors.

Local management has a direct responsibility to create and maintain safe conditions. Local and district officials of the union can exert a powerful influence for increased safety and efficiency upon the mine workers.

Safety Record—A Result of Cooperation, by Ewalt Herzog, safety director, Hanna Coal Co., Cadiz, Ohio.

Official Hanna Coal safety statistics for the past 13 yr show that in December, 1945, accident frequency for the company was 55.11 and total lost-time accidents added up to 928. Severity was 8.44. By the end of 1951, frequency had dropped to 21.27, total lost-time accidents to 88 and severity to 7.14. At the end of 1956 comparable figures were: Frequency, 17.79; total lost-time accidents, 64, and severity, 11.82. At the end of November, 1958, the figures were: Frequency, 5.68; total lost-time accidents, 14, and severity, 0.34.

This kind of progress is a result of a number of approaches. Management is sold on the benefits of safety and provides solid, sincere backing to the effort. Training and retraining of foremen is a constant process. Every effort is made to help the foreman develop his leadership abilities. The result is that the men soon learn to respect the judgment and knowledge of the foreman. Up-to-date incentives, employee gatherings and picnics, slogan contests and so on, provide outlets for a constant emphasis on safety.

Foremen's Forum

WHEN YOU FACE A PROBLEM, refer first to your successful ventures under similar circumstances. Don't concentrate exclusively on past mistakes.

Three Steps to Greater Success

Study your achievements, the author says, if you want to increase your chances of success. If you study your mistakes, you will know all about mistakes—but that's not the way to get ahead.

By **Bernard Haldane**
School of Business Administration
Fairleigh Dickinson University
Rutherford, N. J.

A NEW THREE-STEP formula will help you to be more successful. The new system is now being taught at the Rutherford and Teaneck campuses (N.J.) of Fairleigh Dickinson University, as well as to executives and professional men and women at the American Management Association in New York City.

Interviews with more than 40,000 men and women over the last twenty years helped to make this discovery possible. Associated work was done with the Harvard Graduate School of Business Administration, Stanford Research Institute, the U. S. Air Force (Research and Development Command), the Society for the Advancement of Management, and other professional and management groups.

These studies showed why most people fail to find the successes they could have. The great majority of people find it easy to concentrate on what they don't want, and harder to concentrate on what they do want. In line with this, it is commonplace to hear people talk about their mistakes, errors, failings.

"Profit from your mistakes," it is said. And because you do not want to repeat your mistakes, because you do want to get ahead, you study your mistakes. You try to find out what you did wrong. People use this system all over the world; it is a generally accepted procedure. And it probably has helped many to avoid making serious blunders. Besides, the world has progressed while the study-your-mistakes practice has prevailed.

People everywhere also know that you learn about what you study. When you study arithmetic, you learn about arithmetic; when you study history, you

they go up easy... stay put!

O-B SHELLS AND PLUGS

That simple phrase explains why more mine roof is supported with O-B Shells and Plugs than any other make of expansion unit.

Underground pull tests have proved to hundreds of bolting crews that these O-B expansion units are stronger than their roof bolts. Hundreds more have learned from personal experience that the four-way expansion of these O-B units can't be equalled for holding power in soft top.

And because bolts equipped with O-B Shells and Plugs don't have to be held in the holes before wrenching begins, bolters have both hands free to run their machines—work faster with less chance of injury to hands and fingers.

For extra strength, expansion, speed, and safety, order the Shells and Plugs that "go up easy—stay put!"

Write direct to Ohio Brass, or ask your O-B representative, for an underground test on your property.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

4831-M

learn about history; when you study mistakes, you learn about mistakes, and that's it.

It should follow that when you study successes, you will learn about successes —and what makes them happen.

But centuries of habit, and a world-wide taboo system, generally prevent the study of successes—unless they belong to someone else. It is quite all right to study your own mistakes; but custom virtually forbids you to study your own successes or achievements. There is a cult of modesty.

People are so careful about taking credit for things they have done or accomplished. The appearance of boasting must be avoided at all costs. Perhaps modesty has even become a sham, a facade for present-day mediocrity, and a protection for those who "let Jack do it." We may be victims of a kind of statistical hypnosis which has made averageness a national objective.

"If we want the exceptional qualities of men to emerge to the fullest, we must encourage each man to grow in his own way," says C. F. Craig, chairman of the board of the American Telephone & Telegraph Co.

In other words, if you want to be more successful, you must be willing to break the taboo against studying your own successes and achievements. For when you study these, you will learn about the ingredients of the kinds of success you really want.

Here's how to start:

Think! Think about personal achievements, things you have done of which you are proud—deep inside. Some of these experiences could be related to making money; many will not; some will be associated with helping people and your community, with social activities, school work, play, hobbies or recreation, etc. The achievements or successes you should think about are things you have done well, experiences that have given you a deep feeling of personal satisfaction.

Now write down brief descriptions of what you feel are your six or more greatest achievements or successes. What others may think about them does not count; it is what you think of them that matters. ("To thine own self be true.") These experiences could have taken place at any time of your life, at any age.

Here is an example: A young man of twenty-four; college senior, with three years of military service. His earliest success, he said, was winning a pre-kindergarten poetry prize; he later won a statewide declamation contest; and most recently, his achievements were associated with writing in his college newspaper.

Another example involves a millionaire friend. Several years ago he reorganized an almost-dead financing company, and led it to substantial success; more recently, he organized and directed a successful campaign to raise money for a new hospital.

Both thought of themselves as failures. One, because he had so little experience; the other, because he now has nothing to challenge him. Yet it is clear—or will be once it is said: the one was seeking a writing challenge, while the other was looking for an organizational challenge associated with finance.

The general rule is, what you have done well before you can do well again. And it is worth trying again, especially if you know it has given you satisfaction, happiness.

Sometimes old hobbies come to life as occupations when you go through this Success Factor Analysis procedure. One man who was very mechanical as a child, was also a good swimmer and saved a life. He joined the Navy, became an engineer, then went back to selling textiles for his father. His Success Factor Analysis revealed hobbies related to shipbuilding, and showed that he enjoyed his hobby accomplishments more than anything else. This understanding and self-knowledge fired his enthusiasm, and he confidently went after a position in the shipbuilding industry—at the time of its greatest depression. He is happily employed in it, and is progressing steadily.

At what age did he start? Forty-three. Another man did it after sixty. It is never too late to start doing right by yourself. And it is never too early.

You cannot build a successful future solely on the correction of mistakes. You can build it on the continuation of successes. But to do this, you must study your successes and achievements; find out the talents and personal qualities you use to achieve them; then use these developed qualifications again and again.

This is the practice of success. It is the same technique a runner uses to improve his form, to improve his speed, to improve his standing. He studies what he wants to do, and then he practices it.

Let me give you the steps to greater success in one-two-three order:

1. Think about your achievements throughout your life. These may be associated with work, or with personal, social, scholastic or other activities.

2. Write brief descriptions of at least six of your greatest achievements, even if you think others may think they are small. These achievements or successes are experiences which have given you a deep feeling of personal satisfaction, and pride.

3. Study these descriptions. Look for the qualities of talent and personality that are used repeatedly. These qualities combine to make your Success Pattern. When you use the Success Factors in combination, you have enjoyable success again and again.

The great majority of people coast along in life using their secondary talents, together with their right to gripe. You need not do that any longer. You can use these Success Factor principles, quicken your progress, and really have job satisfaction. You can be your best more often. In fact, this three-step formula will help you to be your best self, and become more successful.

A Matter of Viewpoint

Although he had started life at a very lowly station, Silas had amassed a tidy fortune through lifelong hard work, ambition and thrift. As he approached the close of his days, he said to his good wife, "Jennie, we have had a good life. You stood with me during the lean years and helped me to become successful. I appreciate all that. Now I have one last request to make of you."

"I shall do whatever you say, Silas," replied Jennie.

"My last wish," Silas said, "Is that when I leave this life you have me buried with that Cadillac I like so much."

"It shall be as you desire," Jennie promised.

Silas passed away.

True to her promise, Jennie sent the white Cadillac to the local garage to be Simonized, lubricated and winterized. She ordered that Silas' remains be prepared in his full-dress suit. She had Silas placed at the wheel of the Cadillac, she placed a French beret on his head, and a big cigar in his mouth.

And as this gleaming spectacle was lowered into the oversized grave, one gravedigger turned to his helper and said, "Man, that's living!"

⅜-inch cord was the primer used with oil-soaked Spencer N-IV Ammonium Nitrate for this blast.

The 28,000 pounds of Spencer N-IV Ammonium Nitrate is now ready for shooting the overburden blast at Calaveras.

Forty 9-inch holes, each containing 700 pounds of material, are shot simultaneously.

27,000 cubic yards of material were moved with such good fragmentation there was no need for secondary shooting.

Progressive Calaveras Cement Company shows how to . . .

Save $7.00 To $10.00 Per Ton Of Blasting Material:

Big saving in priming costs plus greater blast energy make new Spencer N-IV most efficient, low-cost blasting agent:

The easiest, most economical blasting method known is now cutting costs and speeding up blasting operations in the Calaveras Cement Company quarry at San Andreas, California. By using new Spencer N-IV Ammonium Nitrate, they are able to save about $7.00 to $10.00 in priming costs per ton of material used.

Different from any prilled ammonium nitrate now on the market, Spencer N-IV reduces priming costs because it can be initiated with a single strand of ⅜-inch detonating cord. There's no need to attach additional material at intervals, or employ other complex priming methods —and you don't have to store high explosives on the job site!

The superior blast effect and easier detonation of Spencer N-IV are the result of a special structure which allows the prills to absorb oil more easily. Combine this with the fact that Spencer N-IV contains a much higher percentage of ammonium nitrate than other brands, and you can see why N-IV gives consistently better fragmentation.

Completely free-flowing for easy loading, Spencer N-IV is packaged in 50-lb. polyethylene plastic bags, as well as 50, 80 and 100-lb. multiwall paper bags. Two years of tests have proven that the polyethylene bags are tougher than paper and can reduce bag breakage as much as 50%. No more trouble with leaking oil—and these bags are so moisture-proof they can actually be stored out doors!

For more information on new Spencer N-IV Ammonium Nitrate in polyethylene plastic or paper bags, mail coupon today!

SPENCER

Spencer Chemical Company
Industrial Chemicals Division
401 Dwight Building
Kansas City 5, Missouri

At no cost or obligation to me . . .

☐ Please rush complete information on Spencer N-IV Ammonium Nitrate for low-cost blasting.

Name.....

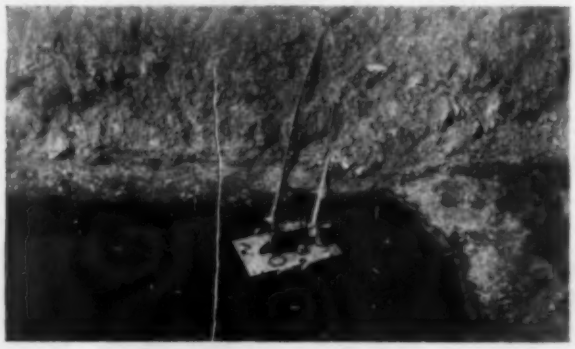
Company.....

Address.....

City.....State.....

COAL AGE

Operating Ideas



Amphibious Pump Carrier Simplifies Strip Pit Dewatering

TO SIMPLIFY installation and movement from pit to pit, Hart & Hart Coal Co., Providence, Ky., mounts pumps on amphibious trailers which travel equally well on land or water. The pump and gasoline motor are mounted in the center of the trailer deck, which is large enough to support a drum of fuel oil and a pump maintenance man while the trailer is floating in water. The amphibious carrier usually is parked at the edge of the pool of water where it can be easily serviced. If heavy rains come and pit inflow exceeds pump capacity, the company never worries about the pump being covered by water because the carrier floats and pumping continues. The company has 10-in centrifugal pumps on the carriers.

Crossover Eases Supplying

SUPPLYING SECTIONS in the No. 2B all-belt mine of the Boone County Coal Corp., Sharples, W. Va., is eased by installing belt crossovers for supply shuttle cars to travel over. The crossovers reduce the time required to supply each section since supplies need to be handled only once. Otherwise they would have to be unloaded and loaded again on the other side of the belt.

The ramps are connected together using 4x10-in headers. When the crossover is not in use, the headers are removed. Ramps are held in place by wire ropes anchored in the bottom which keep them from moving and interfering with the belt.

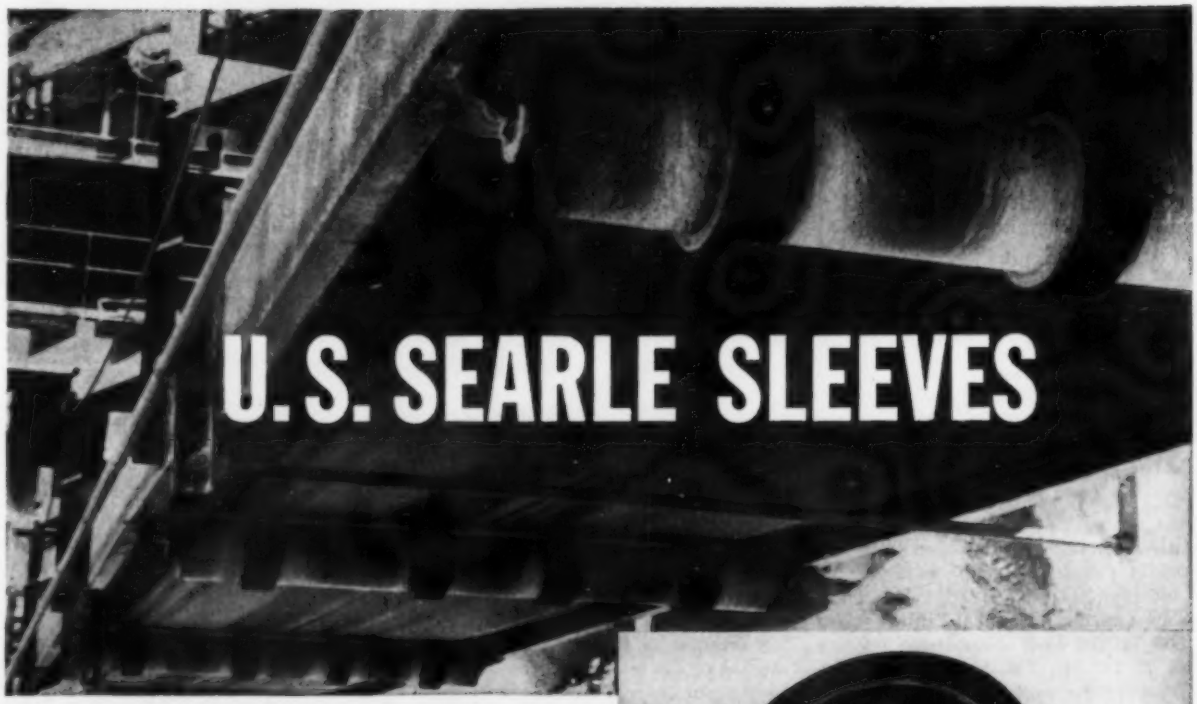
Dozer Converted to Pumper

A SELF-PROPELLED PUMP solves the problem of removing isolated bodies of water in spoil areas at the Hart & Hart Coal Co., Providence, Ky. The company took an old TD18 bulldozer, added a small platform for a pump and made some minor changes to the machine itself and came up with a self-propelled pump.

A small platform mounted at the rear of the tractor holds a 10-in Gorman-Rupp centrifugal pump, which is driven by the tractor engine. A small boom with a wire rope and clamp also is mounted at the rear of the tractor so most of the weight of the suction line can be transferred to the tractor when the unit is located at the top of a steep bank. This support takes the strain which otherwise would be on the short section of rubber pipe connecting the pump to the suction line. The self-propelled pumper also is able to level off a pumping site with its blade or cut a road to a body of water.

SEARLE SLEEVES

The patented proven way to prolong conveyor belt life!



The patented Searle Sleeves are made of abrasion-resistant cushion rubber reinforced by heavy belt duck. Installation is fast, just slip them over the idler rolls. At impact points, cementing is recommended.

The build-up of wet muck in coal mining and fines and dust in metal mining are minimized or completely prevented on belts when idlers are equipped with U.S. Searle Sleeves. These Sleeves protect idler rolls from impact damage at transfer points. Keeping idlers clean and free from build-up eliminates constant servicing, and at the same time insures longer belt life. Belt "wandering" is eliminated and edgewear greatly reduced on both belt and idlers.

• • •

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

Close-up of U. S. Searle Sleeve. Available in large variety of sizes to fit conventional conveyor idlers.

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

Operating Ideas (Continued)

Easier, Safer Roof-Bolt Recovery With Special Jacks

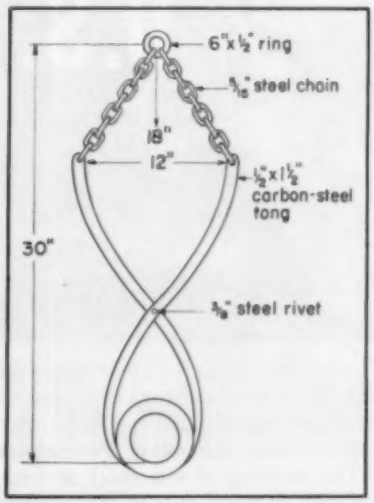
ROOF-BOLT RECOVERY is simpler, safer and easier with the aid of special roof-bolt recovery jacks that are tripped and recovered at a safe distance after bolts are removed. Weighing only 36 lb for a 72-in size, the jacks are made of high-strength aluminum alloy for easy handling. Manufactured by the Templeton, Kenly & Co., the Simplex M279 jack has a 24-in rack-bar travel at the upper end. The jack is tripped by pulling a rope which is secured to a release lever. A protective rim at the base of the rack-bar section of the jack protects it from damage when the jack falls to the ground.

Sure-Grip Tongs Handle Stock Safely

CHANGING STOCK in the lathe, shaper and planer, plus handling locomotive wheels are simplified with the aid of this set of tongs, writes, T. H. Anderson, Oak Ridge, Tenn. The tongs shown in the illustration can lift up to 800 lb and have a maximum opening of 12 in. Mr. Anderson says this size is suitable for most jobs around the average shop, but he notes that a 1,000-lb set sometimes is needed.

Short stock is handled with one set of tongs, while the longer pieces require two sets with a spreader between them to insure a straight upward lift.

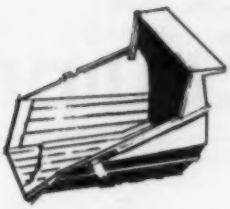
Armatures, too, are more readily picked up and placed in the lathe, banding machine or winding machine with the aid of the tongs. It is much easier to fit a pair of tongs around an armature than to make a rope sling with a slip-knot, Mr. Anderson notes.

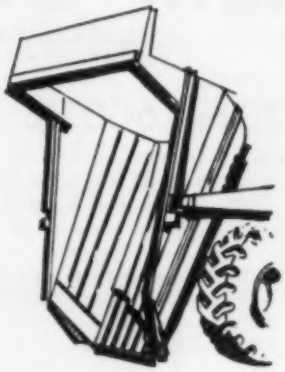


Cover Prevents Tampering

THE POSSIBILITY of unauthorized persons attempting to start and operate a bulldozer when left unattended overnight or over weekends can be eliminated by making a simple sheet-metal cover for the controls. The cover shown in the illustration was made for an International TD9 crawler tractor owned by Colfax County, Neb. It is locked to the control box itself and has a handle on top for easy removal or placement. Material for making a cover can be found in nearly any scrap pile and it can be cut and welded into a cover by a shop worker at odd moments during the day.

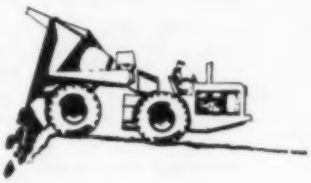
Haul problems?





Easier loading—Wide bowl offers large "target" for easy-loading without spillage. Open rear of body provides wide, low entry for dipper—an extra speed advantage for your shovel.

Resist body shocks, damage—Rear-Dump stands up under heaviest loading jolts. Bowl is all steel—no wood fillers. Floor is lined with heat-treated tool-steel strips, welded to solid billets laid over heavy steel plate. Sloping sides deflect load shock, quickly cushion small floor area with layer of material against rock-damage.

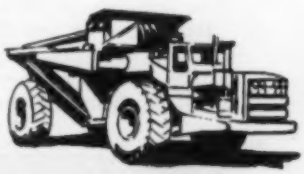


Quick, positive dumping—Flick of fingertip switch on control panel instantly activates point-of-action electric hoist-motor. Body raises quickly to desired angle. At full dump position, edge of bowl is low behind rear wheels... material cannot roll forward to lodge against wheels, nor pile under rear end. Streamlined body sheds stickiest material readily. Front-wheel drive keeps power and traction on solid footing—well ahead of rear wheels—when dumping over high banks.

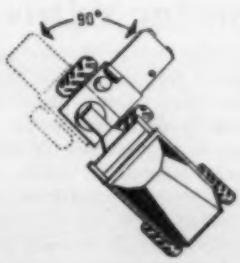
L-W Rear-Dump may be your answer!

No two hauling jobs are exactly alike. Each has its own particular problems. There are long hauls and short... all types of earth-born materials. Some jobs have restricted loading and dumping areas. Others tough grades, rough temporary haul roads. And there are wide variations in maintenance and repair problems—depending on loads, abrasive material, shock, weather, and available facilities and servicemen. So finding the *right kind* of hauler to solve your present and future problems isn't easy. That's why we think you might like to check these "problem-solving" features found only on LeTourneau-Westinghouse Rear-Dumps. All these special advantages of this off-road hauler are available on all three sizes: 11, 22, 35 tons load capacity... 138, 210, 300 or 335 hp. And, to ensure steady earnings for you, other hauled units can be used behind same Tournapull® 2-wheel prime-mover. These include scrapers, bottom-dumps, flatbeds.

Hauls anywhere—Machine's big, low-pressure tires—5 to 6' tall, 1½ to 2' wide—"float" machine over sand, mud, rocks, RR tracks, or other obstacles. Broad tire-lugs maintain traction in any type of material. Power-transfer differential puts up to 80% of power on drive wheel with firmest footing, when either powered wheel begins to spin. Electric pivot-turn, through geared kingpin, lets operator "walk" prime-mover out of soft spots. Dumping action can also be used to "hump" hauler off a soft bank.



Faster spotting—Positive, electric power steer, through geared kingpin... pivots prime-mover to right angle for short 90° turns. As a result, unit makes continuous U-turn in less space than Rear-Dump's own length. In dump position, it turns in only about ⅔ of over-all length! Result? You spot faster at the shovel... grizzly or hopper... and get away faster from congested pit or dump areas.



Simplified construction—Look underneath a Tournapull Rear-Dump... note that this machine needs no springs, no tie rods, no hose and pipe lines, no frame, no long drive-shaft that require maintenance and repair. In place of a foundation frame and body sub-frame, Tournapull prime-mover and trail-unit are hitched together by means of a high horizontal yoke. Yoke pivots horizontally on kingpin at front... then extends back along side of bowl, where it pivots vertically just above and ahead of rear wheels. This vertical and horizontal kingpin arrangement provides an easy oscillating action that eliminates most twisting, tilting strains... permits higher speeds on uneven ground.

R-1852-G-1

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

Equipment Developments

Diesel Engines—20 to 1,600 Hp.

"These engines will be competitive in the area of fuel consumption and vastly superior competitively in size, weight, durability and cost"—thus the Detroit Diesel Engine Div. of the General Motors Corp., Detroit 28, Mich., sums up its new, advanced-design, two-cycle diesel line. Including V types and a new series, Detroit Diesel now offers units ranging from 20 to 1,600 hp for stationary use, construction equipment, trucks and all other engine applications.

Present Series 71 and 110 engines have been supplemented by new engines as follows:

Series 53: 2-, 3-, 4- and 6-V types providing continuous ratings of 24, 38, 51 and 76 hp at 1,200 rpm, and 35 (1,800 rpm), 64, 87 and 130 hp at maximum rated speed of 2,200 rpm. Engine weights (fan-to-flywheel) are 740, 890, 1,040 and 1,340 lb.

Series 71: 6V, 8V, 12V and 16V, with ratings of 112, 150, 224 and 300 hp at 1,200 rpm, and 170, 227, 340 and 454 hp at rated maximum speed of 1,800 rpm. Engine weights are 1,855, 2,305, 3,205 and 4,710 lb. Twinning and quadding the 8V and 16V increase total horsepower to 910 continuous, 1,292 maximum intermittent and 1,600 maximum with turbocharging. Such turbocharging is available on all V engines in both series.

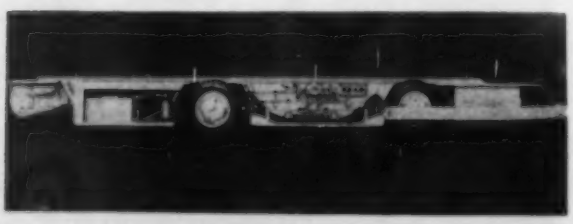
The present 71 series provides 2-, 4- and 6-cylinder engines in continuous ratings, 1,200 rpm, of 33 to 112 hp, and at maxium speed of 1,800 rpm, 48 to 170 hp. Weights range from 960 to 2,190 lb. The 6-cylinder 110 series provides continuous ratings of 75 to 160 hp at 1,200 rpm, and 113 to 260 at maximum rated rpm of 1,800.

Features and advantages of the new engines, as noted by Detroit Diesel, include the following:

Two-Cycle Principle—Approximately twice the horsepower per cubic inch of displacement and more horsepower per pound of weight (average decrease in pounds per horsepower in V units is 20%; maximum, 55%). This benefit, the manufacturer notes, is attained with virtually no change in length, width or height.

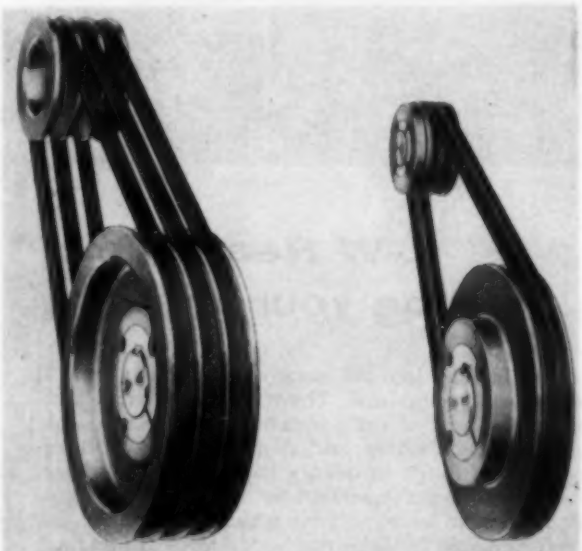
Greater Parts Interchangeability—Higher service use parts, in particular, are interchangeable to the point where "the main difference between V and in-line engines is the crankshaft and cylinder block."

Durability—The new V engines, Detroit Diesel observes, will have durability comparable to that of the present 71E because of rigid construction and "the lower fuel input required to attain the same horsepower ratings."



Low Shuttle Car

For very-thin seams a new model Torkar shuttle car with an over-all body height of only 25½ in has been announced by National Mine Service Co., Pittsburgh, Pa. This Type 26 TorKar has all the design features of the larger TorKars, states the manufacturer. Basic capacity is 110 cu ft increasable through use of sideboards which provide 8½ cu ft extra capacity for every inch of sideboard. National Mine offers AC or DC TorKars in three styles: the new Type 26; Type 30, with heights ranging from 30 in to 42 in; and Type 48, 36 to 60 in. The TorKar, declares the firm, incorporates a unique shuttle-car design featuring effective simplification of the electrical system. Only a single AC or DC motor is required, with power from the motor transmitted through a torque converter.



CONVENTIONAL TAPER-LOCK DRIVE

NEW DYNA-V TAPER-LOCK DRIVE

COMPARISON, ILLUSTRATED ABOVE — 3 HP, 1750 RPM, 2.41 TO 1 RATIO

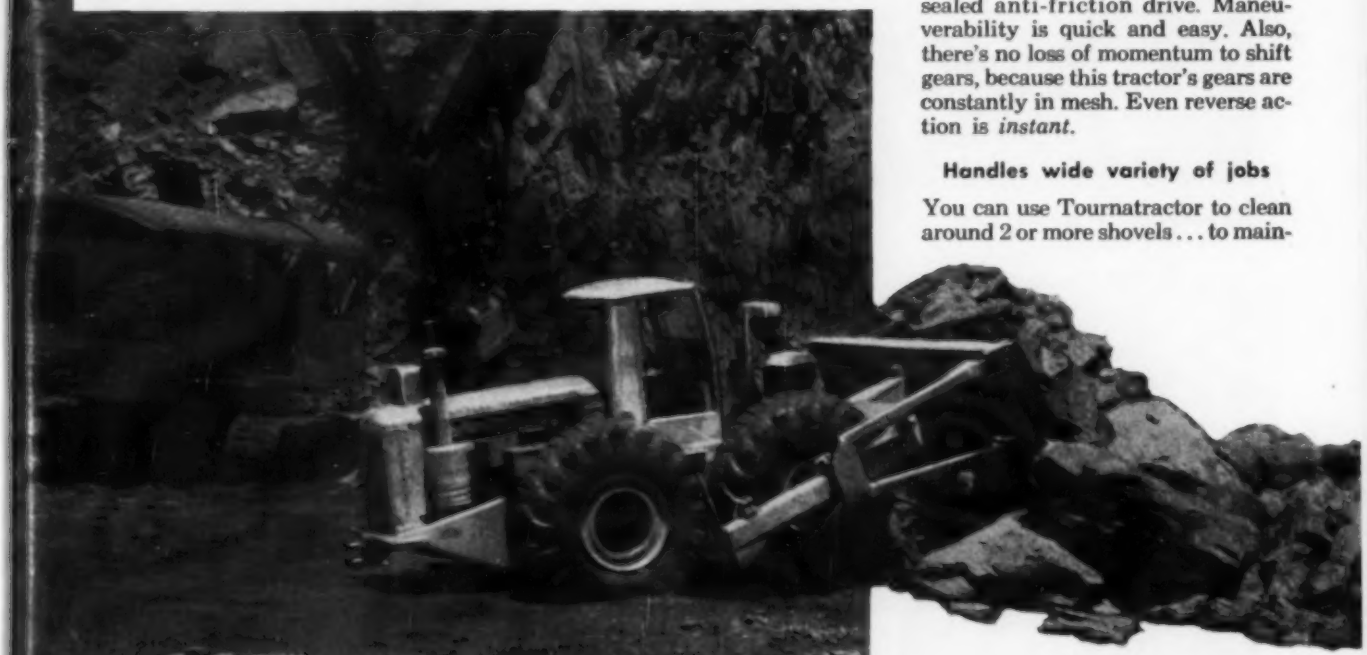
	BELTS		SHEAVES			CENTER DISTANCE	HP	WEIGHT (lbs.)	COST	
	Number	Size	O.D. Driver	O.D. Driven	Width				Per hp	Per Drive
CONVENTIONAL TAPER-LOCK DRIVE	3	A-25	4.15"	8.95"	3½"	13.3"	4.62	24.7	$3.91	$17.33
DYNA-V TAPER-LOCK DRIVE	3	3V-850	3.35"	8.05"	1⅞"	13.8"	5.0	18.0	$4.00	$22.50
% SAVING (Savings vary with different sized drives)			19%	10%	54%	12%	+	27%	23.6%	17.8%

Smaller V-Drives

Smaller lighter sheaves and V-Belts of higher capacity highlight the new line of V-Belt drives put out by Dodge Manufacturing Corp., Mishawaka, Ind. With the new "Dyna-V line," which covers the complete horsepower capacity range in conventional drives, belts only 3/8 in wide and sheaves reduced in width and outside diameter will be needed. Besides the 3/8 in size, known as 3V, the company is making a 5V or 5/8 in size for higher horsepowers. Sheaves in the 3V series, from 1 to 10 grooves, are designed for drives ranging from 1 to 50 hp. The 5V series will include sheaves to take from 3 to 10 of the 5/8-in belts and will handle drives up to 200 hp.

(*Continued on p 124*)

Why use separate machines and operators on scattered tractor jobs?

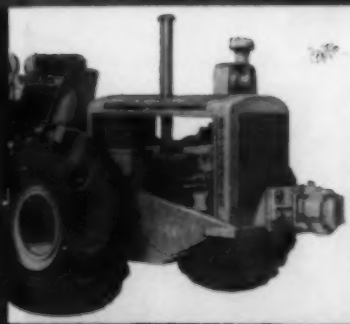


Handle your widely-separated pit maintenance and clean-up jobs swiftly and economically with one man and a LeTourneau-Westinghouse Tournatractor®. Rubber-tired tractor speeds to the job under its own power . . . over RR tracks, paved roads, down shot banks, or cross country. There are no delays for load-and-haul to new locations.

L-W tractor gives you better speed at the work area, too. Acceleration is fast, with 210 hp operating through sealed anti-friction drive. Maneuverability is quick and easy. Also, there's no loss of momentum to shift gears, because this tractor's gears are constantly in mesh. Even reverse action is *instant*.

Handles wide variety of jobs

You can use Tournatractor to clean around 2 or more shovels . . . to maintain stockpiles, level waste dumps, clean debris off RR tracks . . . to clean benches, handle shallow stripping . . . to tow air-compressors, or pull supply and service wagons. You can even use this speedy, mobile tractor for maintenance and clean-up in one or more adjoining pits.



With standard type E railway coupler — one of ten multi-service Tournatractor attachments available — this speedy, powerful tractor becomes a versatile off-track switcher, as well. Use it to spot and group rail-cars fast. Big tires on SwitchTractor† straddle rails, ride on ballast and tie-ends — deliver double the tractive effort of steel-wheeled switchers, rolling on smooth steel rails.

Biggest tractor value today!

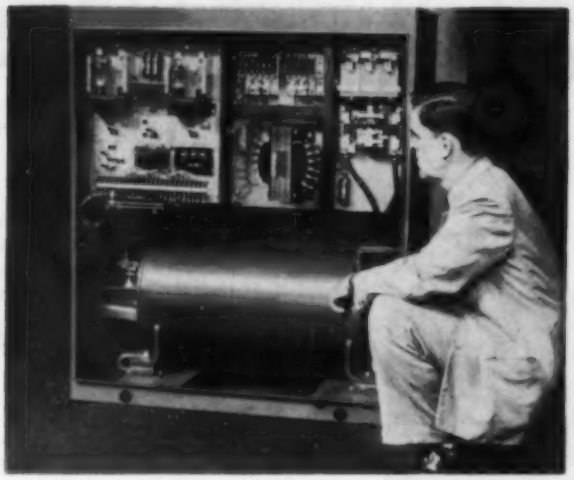
In addition to giving you these plus operating advantages, LeTourneau-Westinghouse Tournatractor *costs less* than a track-type tractor of comparable horsepower. Let us demonstrate this rubber-tired tractor at your pit. Watch it perform under *your* working conditions. You'll find it can handle scattered tractor jobs faster, more efficiently, to help cut pit costs.

†Trademark CT-1865-MQ-1

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



Motor Drives

Reliance Electric and Engineering Co., Cleveland 17, Ohio, and Reeves Pulley Co., Columbus, Ind., division of Reliance, have a variety of new drive units available. Parent Reliance has just unwrapped the "Super 'T' VS Drive," (photo) new packaged electrical drive system with size reduction up to 35% over comparable existing drive units from 3 to 350 hp, says the firm. These drives will commutate up to 200% current for one-minute periods and will handle even higher transitory peak loads, according to the manufacturer. Reeves Co. offers "Motodrive," mechanical drive with base mounting for direct coupling to pumps, gear boxes, agitators, mixers or other driven machinery. Coming in sizes 1/4 through 5 hp with NEMA C-face; 1 to 2 hp with a NEMA P-base; or 1/4 through 10 hp with NEMA D-flange, these drives are said to provide infinitely variable speeds and to produce smooth, constant torque on variable-speed output shaft.

Bigger Scraper

The BT Fullpak scraper, made by LeTourneau-Westinghouse Co., Peoria, Ill., features a struck capacity increased from 18.7 to 21 cu yd, reports the firm. Designed for use with tractors of 150 hp or more, the BT Fullpak is Let WesCo's largest tractor-drawn scraper. It has a broad, smooth-bowl interior free from obstructions, minimizing friction and loading resistance, the company states. An important feature is the extremely flat position of the bowl floor—only a 1-deg tilt when in loading position. As a result, states Let WesCo, material slides into and out of the bowl easily.

Fast Belt Splicing

What is termed a "revolutionary new field splice" is now available from Manhattan Rubber Div. of Raybestos-Manhattan, Inc., Passaic, N. J. Designed to cut down the costly, time-consuming operation of field vulcanization, the new patented field splice, declares the firm, makes an equally dependable and longer-wearing splice for virtually every belt operation. Known as "Wedlok Splice," the product is a high-tension mechanical fastener consisting of a V-shaped joint that forms a seal under tension. Specially designed tip and tail fasteners at the extremities of two rows of bolt and plate fasteners secure the splice. It can be completed quickly and easily with ordinary skill and the necessary tools to make a conventional Flexco bolt and plate fastener joint, states the firm. And the splice, it is noted, will be equal in dependability, safety, tightness and durability for operating tensions up to 700 lb per inch of width rating on belts of 5 or more plies and thicknesses of 1/2 in and over.

Cutter Bits

Austin Powder Co., Cleveland 13, Ohio, announces two new cutter bits for continuous mining machines. Known as AP-10 end mill type and AP-10D plug type, they are said to provide maximum service life even under the most severe cutting conditions. This is achieved by virtually eliminating tip loss and shank breakage, states the firm. The tip area on each model features a large surface for brazing of the carbide insert. Efficient tool performance is said to be further assured with alloy-steel shanks.

Heavy-Duty Lubricant

Gulf Oil Corp., Pittsburgh, Pa., announces Gulf Mining Lubricant H. D.,

B.F.Goodrich

B.F.Goodrich tires give coal hauler 50% more service than any other make

TWIN SEAM MINING CO. of Tuscaloosa, Ala. operates 17 dump trucks to haul coal over dirt roads that are mountainous and winding. Payloads average 15 tons. Tire blowouts from impacts against rocks were a problem for Twin Seam. Then they switched to B.F.Goodrich Rock Logger tires. Result: no road delays caused by punctures or blowouts, and 50% more service than from other makes. Rock Logger tires are retreaded after 100,000 miles for an additional 50,000 or more miles!

B.F.Goodrich builds the Rock Logger with a specially compounded tread that resists rock cuts and bruises. Under the tread is the B.F.Goodrich FLEX-RITE NYLON cord body. FLEX-RITE NYLON withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. No wonder this B.F.Goodrich cord construction outwears even extra-thick treads, can still be retreaded.

Take a tip from Louis Bosch, head mechanic at Twin Seam, who says: "Rock Logger tires give excellent traction—and can really take a beating!" See your nearby B.F.Goodrich Smileage dealer today. He's listed under Tires in the Yellow Pages of your phone book. *B.F.Goodrich Tire Co., A Division of The B.F.Goodrich Co., Akron 18, Ohio.*

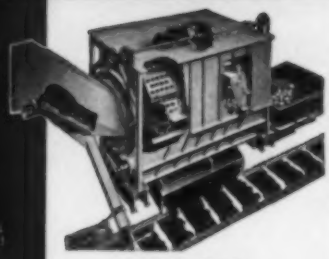
Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

Smileage!

B.F.Goodrich *truck tires*

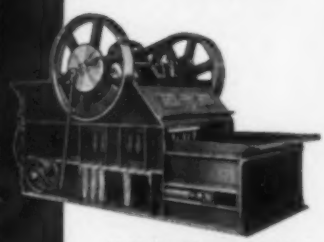
© The B. F. Goodrich Company

America's most complete line of CRUSHING EQUIPMENT



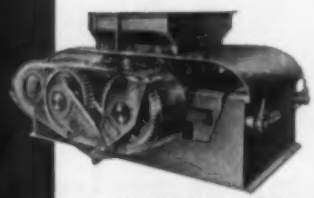
McNally Pittsburg Rotary Breaker

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



McNally Norton Vertical Pick Breaker

50% Less fines when reducing lump to egg and stove sizes.

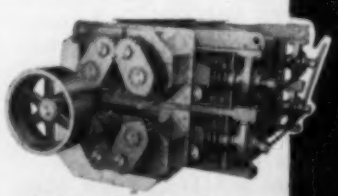


McNally Double Roll Gearmatic ROM Breaker

Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.

McNally Gearmatic Stoker Coal Crusher

This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.



McNally Two Stage Crusher

This unit consists of a double roll primary crusher mounted above a double roll secondary crusher—compactly arranged into a single rigid structure.

Available From Stock and on Short Delivery

For immediate action on complete information write, wire, or call.

McNALLY PITTSBURG MFG. CORP.

Pittsburg, Kansas Wellston, Ohio

Equipment News (*Continued*)

designed for superior performance with heavy loads at high temperatures. Supplementing Gulf Mining Lubricant B, the new product, the company notes, is a multipurpose, semi-fluid grease having superior resistance to water, extreme pressures and high temperatures; also it will not thicken, channel, or thin out in normal operation. The lubricant, said to meet face requirements with the exception of oil for hydraulic systems, can be applied by pouring or with a pressure grease gun. It comes in either 5-gal closed-top drums or 120-lb drums. The former has a pull-out stop, making it unnecessary to remove the lid.

Limit Switch

First of a new line of heavy-duty limit switches announced by Westinghouse Electric Corp., Pittsburgh, is the Type HDH hatchway unit, available in general-purpose weatherproof, dusttight and watertight enclosures in ratings up to 600 V at a maximum continuous current of 25 amp, AC or DC. Switching elements are easily adapted for circuits as follows: one or two normally closed, one or two normally open, and one normally open and one normally closed. Blowouts may be added to double interrupting capacity.

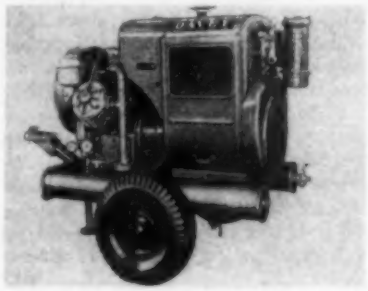
Two-Part Filter

For respiratory protection against all dusts not much more toxic than lead, pneumoconisosis-producing and nuisance mists, "Red Devil" respirator filter is available from American Optical Co., Safety Products Div., Southbridge, Mass. The device has two sections—a prefilter and the filter body. The prefilter has viscose fiber construction, not as dense as the filter body which contains ultrane asbestos fibers. This "variable density," increasing from front to back, increases filtering efficiency and prevents rapid plugging of the filter, thereby stopping fast increase in breathing resistance. Not affected by climate, the filter fits standard AO single and twin cartridge respirators, the firm says.

Ultraviolet Detector

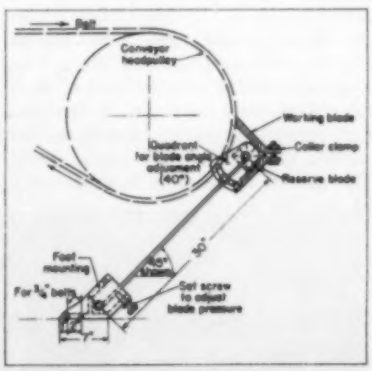
Using invisible ultraviolet rays to detect fire and explosive vapors may soon be common in the coal mining industry, reports Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The com-

pany has invented a sensitive tube that literally "sees" invisible ultraviolet light thereby reacting to flame, smoke and combustible vapors simultaneously, it is stated. In the photo, the tube, about the size of an index finger, turns on all three warnings as an experimenter lights his pipe.



Light Air Compressor

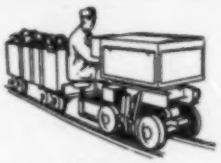
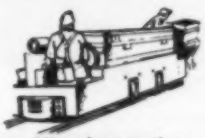
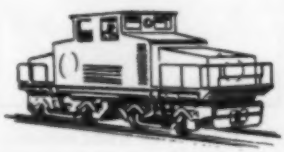
A 75-cfm compressor made by Davey Compressor Co., Kent, Ohio, features lower weight, more economical operation, low cost and great portability, according to its manufacturer. Known as the Davey "Super Chief," the unit is a 3-cylinder, air-cooled type with stainless steel efficiency valves guaranteed never to carbon. It has gear-driven pumps on both engine and compressor, and a built-in unloader system maintains any predetermined air pressure up to 100 lb automatically, adds the firm. The firm says the Super Chief, with its 6:00 9 balloon tires, can be towed behind a truck or car up to 50 mph.



Efficient Belt Cleaner

The sketch shows the L-J belt cleaner manufactured by Lambert-Jones Rubber Co., Pittsburgh 22, Pa. The cleaner comprises a rubber blade assembly mounted between quadrants supported by leaf springs which connect into foot mountings. Two firm rubber blades are provided—one a working blade and the other a reserve. The blades are vulcanized to a 3x3x¼ steel angle either standard length or longer to clear existing equipment. Blade thickness is 1 in and contact

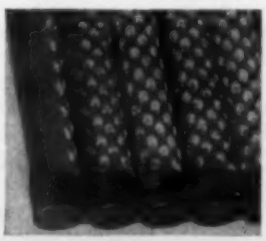
NEW EXIDE-IRONCLAD LOCOMOTIVE BATTERIES PACK UP TO 45% MORE POWER

APPLICATION	NEW TYPE BATTERY	CAPACITY PER POS. PLATE	REPLACES BATTERY TYPE	PERCENT CAPACITY INCREASE
 Trammers	MG	45 ah	MVM ML	32.4 17.5
 Mine locomotives	RG	55 ah	ML TLM	43.6 5.0
Shuttle cars	TG	72 ah	TLM TH	44.0 20.0
 Battery locomotives	TEG	95 ah	(new type—no prior data)	
	MEG	145 ah	MEH MEX	45.0 21.0

Boost the work capacity of your locomotives

These new, advanced Exide-Ironclad Batteries pack more power in the same space. They equip your present locomotives to do more work. And they actually cost less per ampere-hour, promise even longer life of service. Get complete information. Call your nearby Exide representative. Or write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide

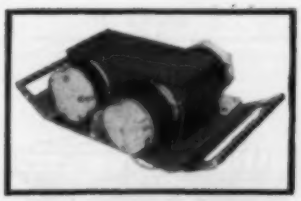


THE SECRET. New tubular construction packs more power in each positive plate . . . prolongs battery life.

now...put 7500Volt portable power cable to work... easily, quickly, safely!

Extend high-voltage a-c power quickly and easily as work progresses—with safe, convenient PLM Cable Couplers. Built especially for service both in open-pit and deep-mining operations, they meet the increasing need for equipment that will permit use of higher a-c voltage systems.

PLM Cable Couplers simplify joining lengths of portable cable together or to electric shovels or portable substations. Each coupler consists of connecting plug and socket, fully insulated and ruggedly protected and weatherproofed against electrical or mechanical damage. Optional locking and grounding features meet complete range of requirements. Rating, 300 amperes, 7500 volts, grounded neutral. Write today for descriptive bulletin 375. PLM Products, Inc., 3881 West 150th Street, Cleveland 11, Ohio.



3 AND 4-WAY ASSEMBLIES
Plugs or sockets are also supplied in 2, 3 or 4-way assemblies for connecting 2, 3 or 4 cables.

SAFE
no exposed connections

SAFE
electrical and key-type interlocks guard circuit

SAFE
contacts always made or broken within housing

CABLE FITTINGS · TERMINATORS · SPLICING KITS

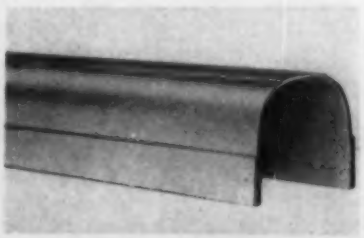
CABLE PLM COUPLERS

Equipment News (*Continued*)

edges are tapered 45 deg to produce a knife-edge effect for removing dirt from the belt surface. Since to do this the blade edge must contact the belt at a precisely correct angle with light pressure, the quadrants are provided for the necessary angle adjustment. When mounted as in the sketch, the blade, performs two important functions in addition to cleaning the belt, according to the firm: Dirt goes directly into the discharge chute, which avoids cleanup; and the usual gap between the belt and the top end of the discharge chute is sealed against chunks of materials being caught and gouging the belt. Nor can sticky fines build up and wear against the belt, Lambert-Jones adds.

Portable Welder

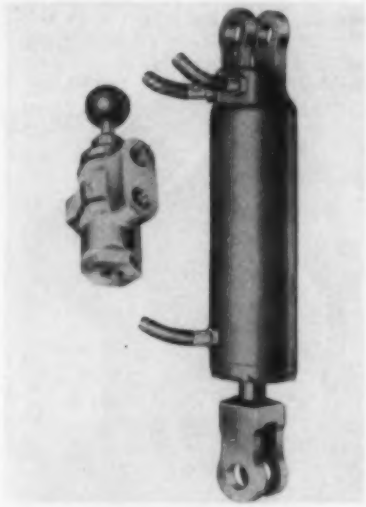
Portable Twin Arc-Welder has been announced by Engine Div., Caterpillar Tractor Co., Peoria, Ill. The welder, equipped with either skid base or running gear, uses the Cat D311 (Series H) diesel engine and two Lincoln electric welding generators which have a rating (NEMA) of 300 amps at 40 V for simultaneous operation of two arcs. For parallel operation the Twin Arc Welder is rated at 600 amps, 40 V. The current range of each generator is 60 to 375 amps.



Trolley Guard

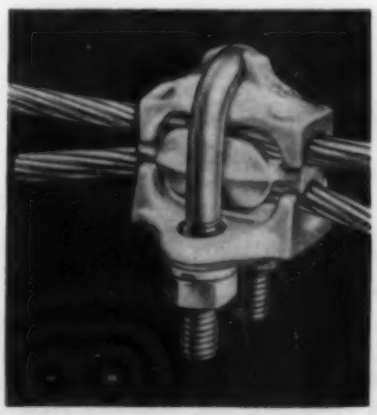
Trolley guards made of tough, vinyl plastic material are available from American Brattice Cloth Corp., Warsaw, Ind. Designed for overhead trolley wire in mines to prevent electrical shock, these guards withstand up to 20,000 V, are flame resistant and will resist spread of flash fires caused by arcing

trolley wires, states Brattice. Because ABC trolley guard is not a coated fabric there is no coating to pull loose or deteriorate. Two grades in 12 and 18-in widths are available—brown and yellow, the latter having higher visibility characteristics.



Double Acting Cylinder

A heavy-duty, hydraulic "Hydro-Stop" cylinder with which the operator can change and maintain the desired stroke hydraulically from a remote station, is produced by Desmore Engineering Co., Inc., Compton, Cal. The device features a floating piston within the cylinder which is controlled by a special valve. This valve is used with any existing 4-way hydraulic system, declares the firm. The floating piston is hydraulically positioned and set at any desired stroke length. It will continue this stroke until the position of the floating piston is changed by the operator.

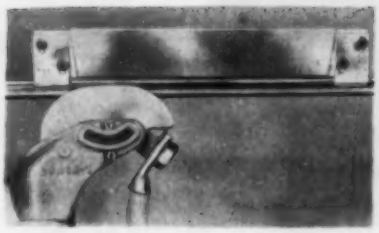


High Strength Connector

Burndy Corp., Norwalk, Conn., announces "Clipit," type UW-R, an aluminum alloy connector for secondary distribution deadending and tap applications where cost is a major factor. Said to exceed the rate breaking strength of ACSR cable on most sizes, Clipit comes in two sizes, cable range No. 6 through 2/0 aluminum or 1/0 ACSR. Easy installation with mutually self-aligning parts and ears of caps that confine cables and prevent splaying is a main feature.

Trolley Contactor

New "Gemco" trolley contactor is installed in a position out of contact with



trolley shoe, thus eliminating any possibility of wear. No false signals or switch operation from contactor rebound is another advantage noted by the manufacturers, General Equipment & Mfg. Co., 116-120 S. Campbell St.,

BELT FAILURES?
Switch to
NEW YORK RUBBER!

New York Rubber, famous since 1851, manufactures belt designed to meet trouble—and overcome it! Built for the most severe service demands, there's a New York Rubber belt designed to solve *your* problem. Mineral mining, quarrying, coal mining—these activities often require a belt that will show superior resistance to sharp and abrasive materials, frequently in the presence of oil and grease conditions. Fire, too, takes its toll of conventional belts.

That's why it will pay you to investigate New York Rubber. A brief description of four of our most popular belts follows. Write on your letterhead for more complete details on these and other superior New York Rubber Belts.

REDUCE FAILURES
with these New York Rubber belts:

STONORE—Highest quality, for most severe service. Handles heavy ores, trap rock, crushed stone, coarse broken glass, slag, cement clinkers, direct feed from digging and mining machinery. Mildew-proof.

DEPENDABLE—For handling coal both under and above ground, sand and gravel, trap rock, sulphur, lime and limestone. Ideal for sub-zero temperatures. Mildew-proof.

NEOPRENE—Resists oil and grease conditions adverse to natural rubber. Handles caustics and coal briquettes. Heat-resistant to 250°F. Mildew-proof.

TEMP-PRENE*—A neoprene compounded for fire resistance and severe, rough surfaces. Mildew-proof.

*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-14".

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NEW YORK RUBBER
CORPORATION
Established 1851
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There is a *difference* in Resistors

P-G Resistors have proved this for many years

Different, because steel and mica, both extremely durable materials, coupled with P-G exclusive design produce a resistor of great mechanical strength. There is nothing to break. With accurate resistance values and adequate carrying capacities, P-G Resistors outlast ordinary resistors. Tell us your specifications and let P-G solve your resistor problem.

For any job . . . Where constant "trouble free" resistor service is wanted . . . you can safely specify P-G Steel Grid Resistors and get better performance with low cost maintenance.

The Non-Breakable Steel Grid Resistor

P-G

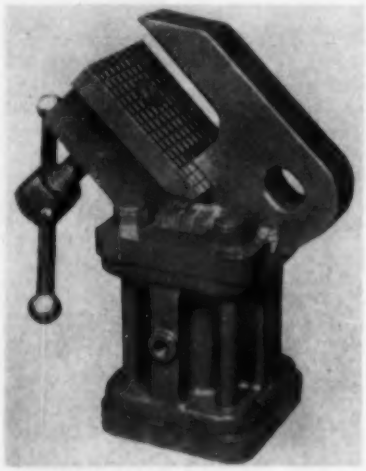
THE POST-GLOVER ELECTRIC COMPANY

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

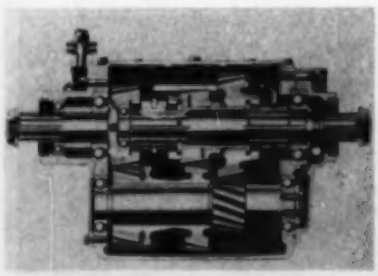
Equipment News (*Continued*)

Louisville, Ky. The unit operates at any speed of the under-running haulage trip, and directional control circuits are made in a quick, positive, dependable manner. Circuitry is designed to prevent burning out of control relay coils in the event the trolley shoe stops on the contactor, the maker says.



Air Vibrator

A new portable air vibrator that can be attached to almost any type of frame, bin, box or table without use of bolts is a product of the Cleveland Vibrator Co., Cleveland 13, Ohio: This portable Cleveland 3-in VGV air vibrator has jaws which open to 2 in and is attached by tightening a vise-like clamp that is a part of the vibrator. It has an eye through which a hoist may be attached for ease in moving the vibrator around, and develops 3,600 vpm at 60 psi with air consumption of about 20 cfm.



Auxiliary Transmissions

Expansion of its line of 3-speed auxiliary transmissions to include a total of 16 auxiliary units has been announced by Fuller Mfg. Co., Kalamazoo, Mich. The nine new sets of gear ratios give Fuller a complete line of 3-speed auxiliaries, the company notes, including splitting ratios, both underdrive and overdrive, for maximum horsepower

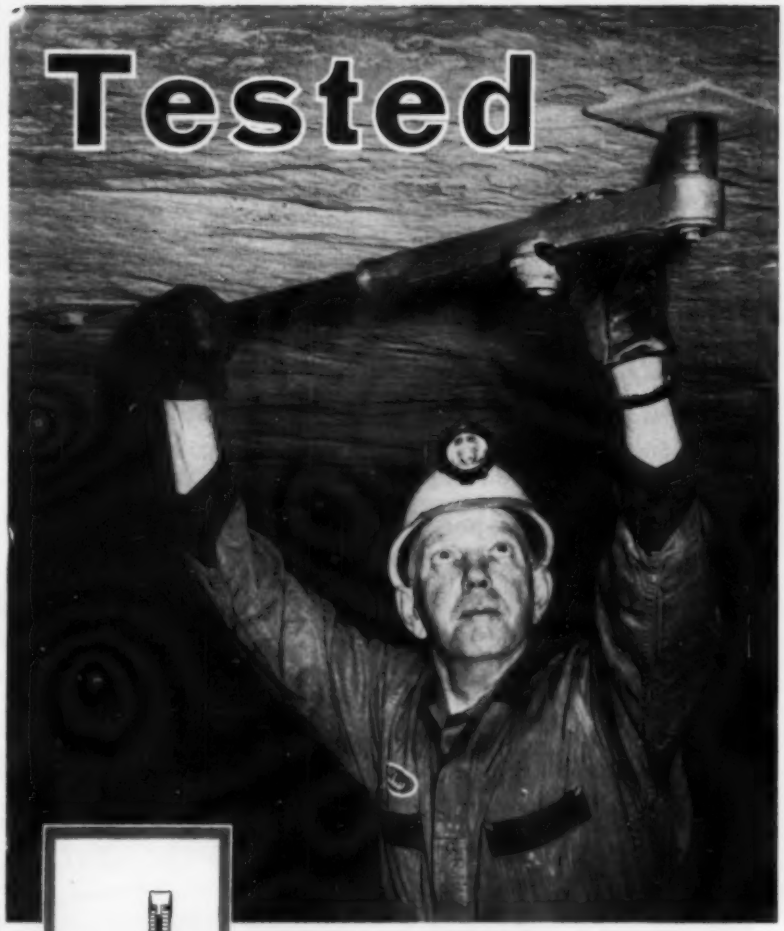
through a full range of vehicle speeds. Deep reductions, in combination with splitting, offer maximum flexibility for both on- and off-highway work. Five new sets (Models 3-D-92 through 3-H-92) complete the heavy-duty 92 Series (illustrated) for engines up to 920-cu in displacement, and four new sets (3-E-65 through 3-H-65) the medium-heavy-duty 65 Series. Ratios vary from 0.74:1 to direct drive in the high ratios and 1.239:1 to 2.64:1 in the low ratios. Features are short length and light weight.

Battery Plate

Greater battery performance at lower cost is the major benefit noted by the Industrial Div., Gould-National Batteries, Inc., Trenton, N. J., in introducing its new "Siliconic" plate for motive-power batteries. All models of the "Thirty," "Kathanode" and "Super Dreadnaught" line will be available with the new grid, made possible, the company observes, by its patented process of introducing arsenic and silver-cobalt sulphates into the active materials of positive plates, preventing grid separations. Life is increased 10 to 25%, with improved electrical characteristics.

Crawler Crane

A new 40-ton crawler machine that lifts and walks more than its own weight is now offered by Link-Belt Speeder Corp., Cedar Rapids, Iowa. Most unusual feature, reports the firm, is that it can be stripped down to an 8-ft overall width and approximately 32,000 lb within 2 hr for fast job-to-job moves. With a crawler base 15 ft long and over 14 ft wide (with 42-in shoes), this new LS-108 has a spread-eagle stance that gives it exceptional stability, according to Link-Belt Speeder, and it will pick and handle 160 ft of the optional "Hi-Lite" tubular boom and jib.



New Dual Slotted Washer Plate, shown here with Suspension Arm inserted. Inquire about this additional service feature!

"West Virginia" Roof Bolts

"West Virginia" expansion units and cone-neck bolts, manufactured and assembled by the Connors Steel Division, H. K. Porter Company, Inc., are double tested to meet every AMC standard.

All components are tested to highest quality standards prior to shipment from the plant. In addition, Field Engineers like Chet Plott, shown above testing torque of roof bolts after installation, constantly check these quality bolting products under actual service conditions.

"West Virginia" pre-assembled Roof Bolts can save you appreciable time and money and assure you of the utmost in safety and service. *For details and personalized service,* call on CONNORS STEEL DIVISION, H. K. Porter Company, Inc., P. O. Box 358, Huntington, W. Va. or telephone JAckson 9-7171.

"Service and Quality"

H. K. PORTER COMPANY, INC.

CONNORS STEEL DIVISION

This winter— speed your colliery operations

Use Sterling Rock Salt to keep your roads, platforms, walks clear and safe . . . to prevent frozen switches and scales. This powerful melting agent helps remove treacherous snow and ice *fast!* It eliminates costly delays around the mine, saves labor during critical cold-weather periods. Sterling Rock Salt is easy to handle and apply, is harmless to hands and clothing.

Give your customers "free-running" coal, too! Sterling Rock Salt prevents coal from freezing in transit, so it can be unloaded quickly and easily. (It takes only 5 lbs. of Sterling Rock Salt to protect one ton of bituminous; 5-8 lbs. for anthracite.) Customers will gladly pay the small premium for coal treated with Sterling Rock Salt! In bulk carloads or 100-lb. bags, regular or Inhibium-treated to prevent corrosion of metal equipment.

Free folder gives further information on Sterling Rock Salt for mines, collieries. Ask your Sterling representative or write to INTERNATIONAL SALT COMPANY, INC., DEPARTMENT CA-159, SCRANTON, PA.

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BRIGHT Yellow COLOR!

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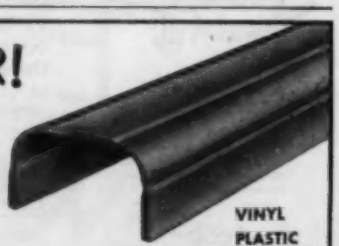


VINYL PLASTIC
Will Not Support Flame

The Trolley Guard with BUILT-IN Safety!

SHAPED RIGHT TO HANG RIGHT. Write for literature.

GUYAN MACHINERY CO. LOGAN, WEST VIRGINIA

Equipment News *(Continued)*

Gearmotors

For vertical mounting, a new line of Gearmotors has been announced by Lima Electric Motor Co., Lima, Ohio. The units, which increase the company's line of electric motors and speed reducers, are available with either flanged mounting face, or with standard vertical extended housing. They come in double or triple reduction units with "Duti-Rated Lifetime" gearing, in ratings from 1 to 75 hp with reductions from 350 to 7½ rpm. They operate at normal torque on 3 or 2 phase, 60 cycle, 208, 220/440 or 550 V.

Improved Blowers

A new line of centrifugal blowers with wide range of pressures and volumes has been announced by Joy Mfg Co., Pittsburgh 22, Pa. Sizes vary from 440 cfm at ¼ in static pressure for a single-width, single-inlet fan to more than 460,000 cfm at 16 in static pressure for a double-width, double-inlet fan. Named "Joy-Centrifoil" fans, these new blowers are an improved design over backward curved fans, according to Joy. The blades on the new blowers have an airfoil shape and provide greater efficiency, silent operation and reduced horsepower, declares the firm. The manufacturer adds that the new fans meet all requirements for commercial and industrial heating and ventilating applications as well as those of a force or induced-draft nature.

New-Type Fitting

A new quick-connect fitting with double-end shut-off for use on pneumatic or hydraulic lines, has been announced by Crawford Fitting Co., Cleveland 10, Ohio. "Swagelok" fitting is designed with instant-acting seals in both parts of the unit, states the manufacturer, completely preventing loss of any pressure from either end of the line when the fitting is disconnected. Flow is resumed instantly when the male and female units are again connected.

Equipment Shorts

ALUMINUM PIPE—Heavy-end aluminum pipe, said to be the first ever offered by the American aluminum industry, has been announced by Reynolds Metals Co., Richmond, Va. It offers increased strength and thickness at pipe ends where welded or threaded joints are made, while actually utilizing less metal in the pipe body, a Reynolds spokesman declares. The pipe is presently offered in selected sizes equiva-

lent to many standard schedule 40 and 80 sizes, and Reynolds feels it may result in up to 27% savings over standard pipe for users.

IMMERSED CONTACTOR — A new heavy-duty oil-immersed contactor, Type 426, designed for applications from 2,000 to 4,800 V has been announced by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. The 400-amp contactor having 40,000-kva interrupting ratings for either 2.5 or 4.8 kv is the first unit of its kind available in the reduced size, says the firm. It is designed to handle 2,500-hp squirrel cage motors at 4,800 V and unity power factor synchronous motors up to 3,000 hp and 4,000 V.

REAR AXLES—Three new two-speed double reduction type rear axles for heavy-duty International trucks are available from the motor truck division of international Harvester Co., Chicago 1, Ill. These axles are for use with Model A-184, AC-1890 and 190, 200 and 220 series International trucks. Ratings of the axles are as follows: RA-162, 18,500 lb carrying capacity; RA-167, 23,000 lb; and RA-172, 23,000 lb.

DIESEL SOLVENT—Pennsylvania Refining Co., Cleveland, Ohio, has developed a solvent, Diesel Gumout, which is said to dissolve and remove the gum and varnish that build up in the fuel systems of diesel engines. In addition the product removes water and moisture from the fuel to give protection against rust and corrosion. The Gumout also can be used in oil heating equipment.

TOUGH WIRE ROPE — Wickwire Spencer Steel Div. of the Colorado Fuel and Iron Corp., Denver, Colo., has a new extra-high-strength wire rope called "Double Gray." Made of improved plow steel, the rope is said to have 15% higher breaking strength and great resistance to wear and abrasion. This, the firm states, has been proven in extensive field tests on rotary rigs, dozers, shovels, draglines and every type of machine imposing heavy loads on rope.

STUBBORN GREASE — Pennsylvania Refining Co., Cleveland 4, Ohio, announces a new grease highly resistant to most fuels and solvents. The new solvent grease is said to be impervious to the washing action of a wide range of petroleum, coal tar and chlorinated liquids. According to the manufacturer, it permits normal lubrication of pumps, bearings and sliding surfaces that must work in the presence of solvents and liquid fuels.

BREAK-IN COMPOUND — Molykote "Wear-In" compound, a new molybdenum disulfide compound offering dis-

VICTAULIC®

METHOD OF PIPING

VICTAULIC HAS EVERYTHING...

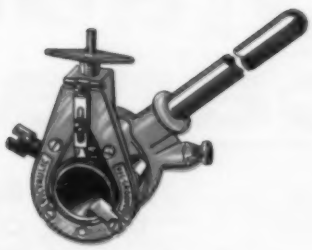
VICTAULIC COUPLINGS
Simple, fast, reliable. *Styles 77, 77-D,* for standard uses with steel or spiral pipe, — *Style 75* for light duty. Other styles for cast iron, plastic and other pipes. Sizes ¾" to 60".

ROUST-A-BOUT COUPLINGS
For plain or beveled end pipe *Style 99.* Simple, quick, and strong. Best engineered and most useful plain end coupling made — takes a real "bull-dog" grip on the pipe. Sizes 2" to 12".

VICTAULIC SNAP-JOINTS
The new, boltless, speed coupling, *Style 78.* Hinged into one assembly for fast piping hook-up or disassembly. Hand locks for savings in time and money. Ideal for portable lines. Sizes 1" to 8".

COUPLINGS FOR EVERY PIPING JOB

VICTAULIC FULL-FLOW FITTINGS
Elbows, Tees, Reducers, Laterals, a *complete line*—fit all Victaulic Couplings. Easily installed — top efficiency. Sizes ¾" to 12".



VIC-GROOVER TOOLS
Time saving, on-the-job grooving tools. Light weight, easy to handle — operate manually or from any power drive. Sizes ¾" to 8".

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"EASIEST WAY TO MAKE ENDS MEET"

Promptly available from distributor stocks coast to coast.
Write for NEW Victaulic Catalog-Manual No. A-1.

VICTAULIC COMPANY OF AMERICA
P. O. BOX 509 • Elizabeth, N. J.

Equipment News *(Continued)*

tinct advantages during breaking in of new machinery, according to the manufacturer, has been announced by the Alpha-Molykote Corp., Stamford, Conn. The new compound is said to shorten the wear-in period without the use of abrasives, reduce galling, seizing and excessive wear during this period and safeguards against shipping delays associated with disassembly, repair and replacement of damaged parts.

CIRCUIT BREAKER—A new circuit-breaker with a pushbutton re-set that puts mobile radio systems back on the air instantly when main cable fuses fail has been announced by General Electric, Communications Products Dept., Syracuse, N. Y. When the main fuse blows, it is pointed out, immediate restoration of communications is vital to those who depend on radio constantly for emergency messages. Smaller than a silver dollar, the circuit-breakers are priced at $1 dollar each.

BUDGET WELDER—Hobart Brothers Co., Troy, Ohio, has a new AC transformer-type arc welder rated 500 amps at 40 V on 60% duty cycle. Called "Budget 500" because of its extremely low cost, it has a welding range of 100 to 300 amps, 195 to 475 amps and 375 to 625 amps. These coarse adjustment steps with rheostat for fine adjustment, provide dual control to permit choice of open-circuit voltage to suit the job at hand, states the manufacturer.

ELECTRICAL INSULATING TAPE—Quaker Rubber Div., H. K. Porter Co., Philadelphia, has developed a tape that is a combination of polyester warp and fiberglass yarn to which a silicone coating is calendered to one or both sides. According to Quaker, the advantages are: 15% elongation; no abrasion between warp and filler threads; and excellent conformability. It also provides a reduced fabric cost which results in a lower price per roll of tape.

NEW DIESEL ENGINE — Detroit Diesel Engine Div. of General Motors has developed a 360 hp diesel engine. It is a series 110 model with a 20% gain in hp attained through turbocharging. The increase in hp reportedly is attained with no appreciable increase in bulk, weight, or fuel consumption. The improved combustion and greater efficiency result from an exhaust driven turbine driving and air impeller that works with the engine blower to increase the fresh air supply to the cylinder.

haulage capacity...

Place: Dante, Virginia
Operator: Clinchfield Coal Company
Car Dimensions: 21'6" (body)
Width: 7'6"
Height: 33" above rails
Weight: 8500 lbs. (empty)
Capacity: 335 cubic feet (level load)
442 cubic feet (crown load)

where can you match it?

Since 1915—
Pioneers in
haulage equipment

DIFFERENTIAL
STEEL CAR COMPANY
FINDLAY, OHIO

Free Bulletins

WHEEL TRACTORS — Two-color broadside explains features of Caterpillar DW-21 and DW-20 series. Brochure deals primarily with Super Turbo engine and Torsionflex seat, two new features. Information also is included on Caterpillar No. 456 and 470 scrapers and how they are matched to the new wheel tractors. Available free from Caterpillar Tractor Co., Advertising Div., Peoria, Ill. Ask for Form No. 33058.

CONVEYING, CRUSHING — Bulletin 458 gives complete information on new Cradle Idler and belt conveyor, including photos, dimensional drawings and capacity tables. Bulletin 658 provides latest information on coal breakers and crushers, with capacities, dimensions and drive data. Both bulletins available free from McNally-Pittsburg Mfg. Corp., Pittsburg, Kan.

GAS MEASUREMENT — Newly improved process control instrument for continuous measurement of concentration of one gas in multi-component mixtures is described in Bulletin No. 0716-2, available from Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburg, Kan.

HEATED FEEDER PLATES—Syntron

Co., Homer City, Pa., announces a new data sheet on electrically heated trough liner plates for Syntron electromagnetic vibrating feeders. Illustrated sheet gives specifications and directions for converting conventional feeders.

DRY FLUID DRIVES—New expanded line of Flexidyne dry-fluid drives and couplings is described in 24-p Bulletin A640B. Included are photos and tables to facilitate selection and an explanation of protective arrangements. Write to Dodge Mfg. Corp., Mishawaka, Ind.

UTILITY TRACTORS—Booklet UT-105 explains many uses of Allis-Chalmers utility tractors Models D-14 and D-17. Catalog UT-103 provides technical details of the two units. Available from Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wis.

CORDS AND CABLES — Okocord flexible cords and portable cables are described in a new booklet which combines technical information and catalog listings. Bulletin 1108 is an all-new 68-p manual, giving dimensional data, engineering information and splicing and terminating instructions. Copy available from The Okonite Co., Passaic, N. J.

SYNCHRONOUS MOTORS, CONTROLS—A 27-p booklet, B-7292, available from Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., presents a summary of types and features of motors and controls. Material includes a discussion of power factor correction, selection factors and special application problems.

WELDING SUPPLIES — Form ADC-848C is a 52-p catalog of welding supplies offered by Air Reduction Sales Co., 150 East 42nd St., New York 17, N. Y. The booklet covers complete line of fluxes, rods, electrode holders, lighters, cable, hose, cleaning tools, protective clothing and so on for gas and arc welding.

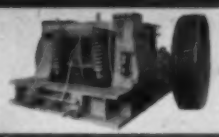
MAGNETIC EQUIPMENT — Full-line bulletin from Stearns Magnetic Products, 635 S. 28th St., Milwaukee, Wis., describes tramp-iron pulleys, electronic metal detector, parts separators, hand magnets and so on. Booklet also details information of Stearns heavy-duty equipment for purification and concentration of magnetically responsive materials.

HYDRAULIC CUTTER—Manco Mfg. Co. offers 70-p catalog on special-purpose, high-thrust hydraulic cutting tools for wire and rod, steel billet, strip, bar, tubing and so on. Also included are section on fabricating, auxiliary power equipment and optional extras for these tools. To obtain a copy write Manco Mfg. Co., Bradley, Ill.

McLANAHAN SINCE 1835

CRUSHERS for COAL and REFUSE

SINGLE ROLL



Rockmaster — High in capacity and ruggedly constructed, it crushes hardest rock, slate and similar mine refuse.

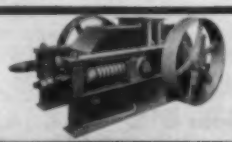
Super Black Diamond — An all-steel, intermediate-duty crusher, this provides many Rockmaster features at moderate cost.

Black Diamond — Steelstrut Toggle protection against uncrushable materials and quick size adjustment are features of this fabricated steel crusher.

Bantam Buster — This is a portable, low-cost unit with a high ratio of reduction. Trouble-free maintenance is a feature.

DOUBLE ROLL

Black Diamond Double Roll — This was designed for moderate to fine reduction of coal where a low ratio of reduction is satisfactory.



Heavy-Duty Double Roll — Economical and noted for service, it is ideal for fine reduction of mine refuse.

TRIPLE ROLL

Black Diamond Triple Roll — Radically new 2-stage design reduces run-of-mine and direct open pit feed coal to fine sizes.

Bulletins Available on All Crushers

McLanahan and Stone Corporation

250 Wall Street. . . . HOLLIDAYSBURG, PA.

Mine, Pit and Quarry Headquarters Since 1835

Among the Manufacturers

Dorr-Oliver Inc. will move its filtration engineering and development division from Oakland, Cal., to Stamford, Conn., on Jan. 1, 1959.

The firm plans to have all filtration engineering and manufacture centered in the East to give better service to customers. Manufacture of filtration equipment is already centered at the firm's Hazleton, Pa., plant.

Gates Rubber Co. will build a $9 million manufacturing plant in Nashville, Tenn., it has been announced.

Scheduled for a Jan. 1, 1960 start, the building will have more than a half million square feet of floor space and will house equipment for tire manufacture, although addition of other products is expected, reports a company spokesman.

Appointment of Kentucky Mine Supply Co. as a distributor for Parker synthetic rubber O-rings for sealing applications has been announced.

Parker Seal Co., division of Parker-Hannifin Corp., is supplying O-ring stocks to Kentucky Mine to assure prompt handling of customer needs, it is reported.

● Performance experience clearly shows the utter dependability and efficiency of custom designed Connellsville Rotary Car Dumpers. Users are familiar and pleased with their sturdy build, low upkeep and long life.

● Available in the complete revolution type or the 180° and return type, Connellsville Dumps are friction, traction, rope, chain or gear driven.

● All units are counterweighted in proportion to the car and live load to be handled. This feature, by introducing a "free" assist in returning the empty car to an upright position, reduces horsepower requirements and cuts power costs.

● Interlocking arrangement between the Dump controls and car hauls permits complete control of the loaded cars at all times.

● Speedy 10 second dumping cycle is set in motion automatically or by push button with cars coupled or uncoupled.

Descriptive literature for the asking.

CONNELLSVILLE
MANUFACTURING & MINE SUPPLY CO.
CONNELLSVILLE, PA.
"SERVING THE MINING INDUSTRY SINCE 1901"

David W. Houston has been named assistant sales manager of Fairmont Machinery Co., Fairmont, W. Va.

A graduate of the University of Pittsburgh, Mr. Houston was formerly control administrator of the Freyn Div., Koppers Co. He joined Fairmont, which makes coal preparation plants and processing equipment for mining, in September.

Electric Steel Foundry Co. has named Hugh Redditt as representative for their Central Sales District.

He will work with ESCO construction and crushing equipment dealers throughout New Jersey, Maryland, Delaware, Virginia and eastern Pennsylvania. Born and raised in Philadelphia, Mr. Redditt studied at Fordham University and holds a degree in business administration.

The Geo-Drill Co., Bridgeville, Pa., is a new firm established by James L. Barret, formerly chief engineer and manager of manufacturing, Pennsylvania Drilling Co.

The company will make a portable diamond core drill and associated diamond bits for drilling shallow mineral-exploration holes and close-tolerance holes in masonry structures for installation of pipe, conduit, etc.

Construction Equipment Div., International Harvester Co., has named Willard F. Hall assistant sales manager.

Mr. Hall, central region sales manager of the division for the last 3 yr, began his IH service at the Minneapolis

district office in 1939. In 1953 he was appointed assistant central regional sales manager for construction equipment, becoming manager of that region in 1955.

The Industrial Hygiene Foundation announced recently the election of Dr. William P. Yant as chairman, Board of Trustees, and the appointment of Dr. H. H. Schrenk as managing director of the Foundation.

Mr. Yant is director of research and development at Mine Safety Appliances Co. and Dr. Schrenk has been research director of the Foundation since 1949. Both men are experienced in industrial and public health and have received awards for service in the fields of health and safety.

LeTourneau-Westinghouse Co. has announced seven promotions in its Merchandising division.

Kenneth W. Chriswell, formerly assistant advertising manager, becomes department manager; Floyd Rager becomes general parts and service manager; Lloyd Rager, Floyd's twin brother, will be manager of motor grader sales; E. L. Cline, assistant to manager of motor grader sales; Robert J. Fahey, central area sales manager; Charles L. Petersen, district representative; David R. Harvey, assistant advertising manager.

"Skip" Jones has been named manager of engine sales of International Harvester's Construction Equipment Div.

Joining IH in 1936, Mr. Jones has held construction equipment posts in Quincy and Aurora, Ill., and in the Chicago general office. From 1942-1946 he was a major in the U. S. Army's Corps of Engineers.

Edward K. Lefren was named manager, technical services, for Hercules Engineering Dept., Hercules Powder Co.

Mr. Lefren, graduate of Stevens Tech, joined Hercules in 1940 as a chemist.

Lucien J. Courtney Jr., has been named manager-sales service for Duff-Norton Co.'s Coffing Hoist Div. in Danville, Ill.

Mr. Courtney, a University of Illinois graduate, had been manager of customer service, coming to Coffing in 1956. He succeeds A. M. Kelly, named district sales manager in San Francisco.

Edgar R. Phillips, 63, sales manager for the Lee-Norse Co., died of a heart attack last month.

Mr. Phillips, a former sales manager for the Pittsburgh Gear Co., had been a sales representative of the Joy Mfg. Co. and Timken Roller Bearing Co. He was a member of the American Mining Congress and the Western Pennsylvania Engineers' Society.

31" HIGH
PORTABLE
UNDERGROUND
TRANSFORMERS
100-225 & 300 KVA

Custom Built to your needs

Photograph illustrates 225 KVA unit — 4160/480 Volt with oil filled primary cutout, grounding resistor and circuit breaker in secondary circuit.

We offer standard or special Underground Portable Transformer Units to include all special features required.

"PRODUCT OF ENSIGNEERS"

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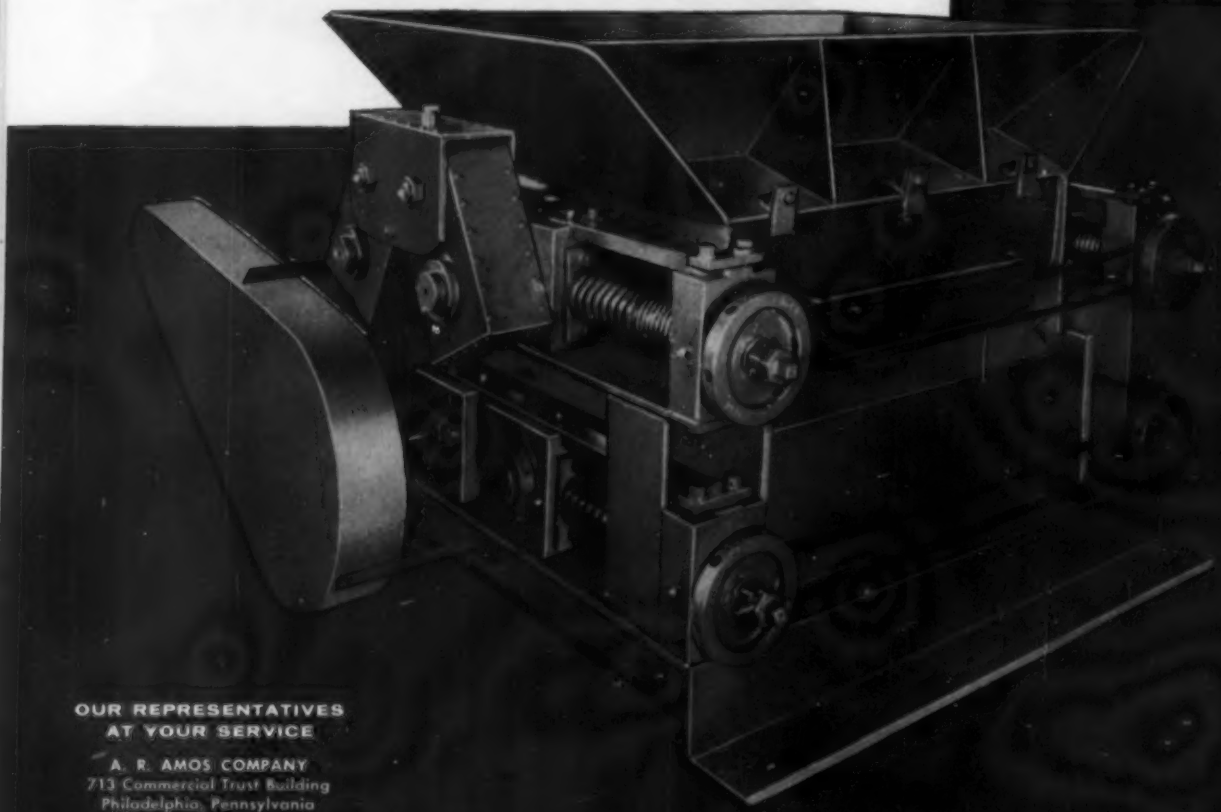
ELECTRIC AND MANUFACTURING CO.
914 Adams Avenue Huntington 4, W. Va.

Meet the Press in a GUNDLACH CRUSHER

Meet the press of today's market where absolute control of top size is essential



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Contractors

Exploration of Coal Properties. Guarantee satisfactory coal cores. Inside Mine Drilling, Pregrouting, Mine Shafts, Large diameter holes.

Huntington 17, W. Va.

DAVIS READ

Consulting Engineer

Layout — Operation
Modern Production Methods
Plant Design — Preparation
120 S. La Salle St. — Chicago 3, Ill.

ROBINSON & ROBINSON

Consulting Engineers

Mine Operation—Preparation
Coal Property Valuation
Industrial Engineering
Union Bldg. — Charleston, W. Va.

THOMPSON & LITTON

Consulting
Civil and Mining Engineers

Surveys • Examinations
Appraisals • Design
Inn Building, P. O. Box 517
Wise, Virginia
Telephone Wise 6215

PAUL WEIR COMPANY

Established 1930

Mining Engineers & Geologists

DESIGN AND CONSTRUCTION

20 North Wacker Drive — Chicago 6, Illinois

J. W. WOOMER & ASSOCIATES

Consulting Mining Engineers

Modern Mines Systems and Designs
Foreign and Domestic Mining Reports
Oliver Building—Mellon Square, Pittsburgh, Penna.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT • BUSINESS
EQUIPMENT — USED OR RESALE
OPPORTUNITIES

DISPLAYED RATE
EQUIPMENT & BUSINESS OPPORTUNITY
advertising $12.50 per inch
EMPLOYMENT OPPORTUNITIES—$21.00 per inch, subject to Agency Commission.

An Advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches to a page

UNDISPLAYED RATE
(Not available for equipment advertising)
$1.50 a line, minimum 3 lines.
POSITIONS WANTED undisplayed rate is one-half of above rate, payable in advance.
Box Numbers—Count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

COAL PREPARATION ENGINEER

Age 32, married, B. S.; M. S. in Mining Engineering, Registered Professional Engineer. Seven years coal preparation experience with major coal producers. Good knowledge most types coal cleaning and drying equipment, laboratory and washability work. Desires position with challenge and responsibility.

PW-9394 Coal Age
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
Worn out or discarded Conveyor Belting
Mines or dealers with accumulation of scrap rubber belting write:
W-7462 COAL AGE
Class. Adv. Div., P. O. Box 12, New York 36, N. Y.

FOR SALE
JOY PERMISSIBLE EQUIPMENT
1 11BU Loader 250 volt DC
2 14RC Shuttle Cars 40 HP Motors
Less than 2 years old. Perfect condition. Reason for sale changing to AC power.

Contact: Mr. J. A. Reeves
Mid-Continent Coal and Coke Co.
Carbondale, Colorado

2 TELPHONES $22.75
Inter-communication handsets, two wire system. Included Two 3 volt batteries, 50 ft. of wire and simple wiring instructions. Additional wire 1 cent per ft. or $25.00 per mile. Complete list of telephone parts, handsets, magneto—common battery — and dial telephones, switchboards, etc. All shipments FOB Simpson, Penna.

Telephone Engineering Co., Dept. CA-19, Simpson, Pa.

Additional "Searchlight" Advertising on pages 140 - 143

WHEN IT COMES TO MINING EQUIPMENT
COME TO ELECTRIC & MACHINE SUPPLY COMPANY

CONVEYORS

963'—48" Belt Conveyor, Complete
1,500'—64B Jeffrey, 36" Belt Conveyor Structure
1,000'—36" Joy Belt Conveyor, Complete
8—36" Joy Belt Drives, Complete
2,600'—36" Barber Greene Belt Conveyor, Complete, Outside type, Excellent Condition
1—36" x 150' Belt Conveyor
4—1,000' centers, 97HC Goodman Belt Lines, complete w/Drives, Etc.
1—MTB Ladel Tandem, 30" Belt Conveyor Drive, 25 h.p.
500'—30" Jeffrey 52B Structure
200'—30" Barber Greene Structure
2—30" Belt Conveyor Drives, shop constructed w/15 h.p. Motor and Controls
900'—26" Joy Belt Conveyor
1,000'—26" Jeffrey 52B Belt Conveyor
16—26" Belt Drives of various types
500'—24" Goodman Belt Conveyor Complete
6—26" Joy Chain Conveyors, Permissible
12—15" Long Chain Conveyor, 350' centers complete w/400 DBH Long mobile head drive, 25 h.p. Motor, 250 V. D.C., Cat Mounted
2—15" Joy Chain Conveyors, Permissible
24—15" & 12" 61EW, 61HG, 61W and 61AM Jeffrey Chain Conveyors
8—G12½ Goodman Shakers, complete w/10" #1 pans
20—G12½, G15 & G20 Goodman Shakers
2—PT12 Long Piggyback Conveyors
29—Goodman Power Duckbills, Model 477
2—PT15 Long Piggyback Conveyors
16—PT15-B Long Piggybacks with 5 h.p. 250 V. Motors

TRACKLESS EQUIPMENT

1—11RU Joy Cutting Machine, 9' Bar, 250 V. D.C.
5—Long 88 Pig Loaders
2—20BU-3E Joy Loaders, 250 V. D.C.
1—14BU-7RBE Joy Loader
1—14BU-7RAE Joy Loader, 250 V. D.C.
2—14BU-3PE Joy Loaders
9—14BU-2E Joy Loaders, 250 V. D.C., 28" O.H.
3—12BU-9E Joy Loaders
1—8BU Joy Loader, Rebuilt
2—Myers Whaley #3 Loaders
4—8SC Shuttle Cars, Elevating Discharge
4—8SC, 8E and 5EX Joy Shuttle Cars, matched pairs, disc brakes, elevating discharge
16—8SC Joy Shuttle Cars
3—5SC Joy Shuttle Cars
2—5SC Joy Shuttle Cars, matched pair
1—5SC Joy Shuttle Car, Elevating Discharge
4—32D Joy Shuttle Cars
4—32E7 Joy Shuttle Cars
4—32E10 Joy Shuttle Cars, Rebuilt
1—32E10 Joy Shuttle Car, Rebuilt
7—42E13 Joy Shuttle Cars, Matched pairs
2—42E7 Joy Shuttle Cars
3—T2-2E Joy Cat Trucks
2—Joy T2-5 Cat Trucks
2—PL11-7PE and 8PE Joy Elevators
2—Acme Self-propelled, 40 h.p. Air Compressors, Permissible
1—50 h.p. Acme, 210 CFM Compressor
1—WK29 Sullivan Air Compressor
2—240 cu. ft. WK-83 Joy Compressors, rubber mounted, self-propelled, 30" O.H., Excellent
1—210 cu. ft. Acme Compressor, on rubber
2—125 cu. ft. WL-82 Sullivan Compressors, rubber mounted and self-propelled
3—Joy T12 Supply Jeeps, Battery, complete w/Batteries and Chargers
2—MGA Bantam Rock Dusters on tires
1—380 Goodman Loader, Rubber Mounted
1—CD25 Joy Coal Drill, Perfect
2—RBD30 CP Roof Bolting Drills
9—Manson Jeeps with 9J Motors
1—Fletcher Roof Bolting Machine, Sliding Head

SUB STATIONS & TRANSFORMERS

1—500KW G.E., M.G. Sets
2—300KW M.G. Sets, G.E.
3—200KW M.G. Sets
1—200KW, G.E. HCC6, 2300/4000 Volt Rotary Converters
1—150KW G.E. Rotary Converter w/Transformers
13—150KW M.G. Sets of various makes and primary voltage
1—150KW Rotary Converter—Completely Automatic
2—100KW Motor Generator Sets
1—100KVA Gasoline Generator Unit
2—50KW, M.G. Sets, 125 V. D.C., 1200 RPM
2—M.G. Sets, 25 h.p., 220/440 V. A.C.
2—Armatures for 150 & 200KW Rotary
2—400 & 900 Auto Transformers
150—Transformers from 5 KVA to 300 KVA

CUTTING MACHINES

3—7AU Sullivans
10—11B Sullivans, 35 & 50 h.p.
16—12AB & 12AA Standard Goodmans
3—112AA Universal Goodmans
4—212AA Baby Goodmans, 250 Volt
4—212G3 Baby Goodman, 220/440 Volt
10—512 and 712 Goodmans, w/Bugdusters
1—824 Goodman, 42" t.g.
1—29U Jeffrey, 250 Volt
1—29U Jeffrey, 220/440 Volt, A.C.
30—35B & 35BB Jeffreys, A.C. & D.C. Bugdusters and Trucks Available

LOCOMOTIVES

2—20 Ton MH77 Jeffreys, 42" t.g.
1—15 Ton Westinghouse Locomotive, unit no. 1443, 28" O.H., 90 h.p. units, pneumatic brakes, trolley pole and controls, 48" t.g.
1—15 Ton HM820 G.E. Locomotive, 90 h.p. units, 44" O.H., 48" t.g., Excellent
14—13 Ton Locomotives, 250 Volt, any gauge
3—12 Ton 29B Goodman Locomotives, 48" O.H.
5—10 Ton Locomotives, 250 Volt, any gauge
14—8 Ton Locomotives, 250 Volt, any gauge
5—7 Ton Atlas Battery Locomotives
1—6 Ton Battery Locomotive—NEW
51—6 Ton Locomotives, any gauge
2—6 Ton Jeffreys, MH150 Locomotives
3—6 Ton MH86 Jeffrey Locomotives
1—5 Ton Locomotive, 250 Volt
15—4 Ton Locomotives, 250 V., any gauge
1—4 Ton G.E. Battery Locomotive
1—4 Ton Mancha Battery Locomotive
1—3 Ton Locomotive, 250 Volt

TIPPLE EQUIPMENT

1—4 Cell Jeffrey Baum Jig Washer
1—CMI Coal Dryer, 48", Excellent
1—Heat Dryer—Complete
1—Marion Double Roll Primary Crusher
1—24" x 50" Pa. Single Roll Crusher
1—30" x 30" Jeffrey Single Roll Crusher
2—24" x 24" Jeffrey Single Roll Crushers
1—18" x 12" Jeffrey Pulverizer
1—5' x 14' Double Deck Vibrator
2—4' x 12' Double Deck Vibrators
1—3' x 8' Low Head Vibrator
5—Jeffrey Traylor Vibrator Feeders
4—Jeffrey Traylor Vibrator Screens
1—Magnetic Separator, Complete
1—Set Jeffrey Dewatering Screens
5—Scraper Conveyors of various sizes
10—Tipple Belts from 15" to 42" width
1—30' x 42" Loading Boom
Air Valves, Blowers, Pumps, New Screens, Parts for CMI Dryers, Speed Reducers, Feeders and many other parts for Tipple.

MINE CARS

39—36" t.g. Drop Bottom Cars
200—42" t.g. End Dump Cars, Various makes
22—42" t.g. ACF 6 ton Drop Bottom Cars
35—44" t.g. Drop Bottom Cars, 10 ton
100—44" t.g. Drop Bottom Cars, various sizes
180—44" t.g. End Dump Cars, various makes
330—48" t.g. S.D. Drop Bottom Cars, 22" O.H.
134—48" t.g. ACF Drop Bottom Mine Cars, 34" O.H.

RAIL AND WIRE

3,000—Tons 56, 60, 70 & 80 lb. Relaying Rail
20,000'—1,000,000 CM Feeder Cable
876'—900,000 CM Copper Feeder Cable
15,500'—750,000 CM Insulated Copper Feeder Wire
8,500'—500,000 CM Insulated Copper Feeder Wire
30,000'—4/0 Stranded Highline Wire
60,000'—4/0 Rubber Covered & Insulated Copper
40,000'—6/0 Trolley Wire
69,000'—2/0 So.ld Copper Trans. Line
10,560'—#4 Transmission Wire
205,500'—#2 Solid Copper Transmission Line
20—Spools New Telephone Wire

MISCELLANEOUS

5—HKL Brown Fayro Car Spotters
2—CH Sullivan 5 h.p. Car Spotters
1—HKG Brownie Layer Loader Hoist
96—Hoists from 5 h.p. to 800 h.p.
320—Stationary Motors: ½ to 600 h.p. of various specifications
1—Prefab Building, 15' x 15'
1—Prefab Building, 25' x 36'
110—Pumps from ¾" to 4500 GPM of various specifications
1—10 h.p. Deming Deep Well Pump
1—330 GPM 6" Pomona Deep Well Pump
1—14" Centrifugal Slurry Pump w/15 h.p. Motor
1,000'—2" Plastic Pipe
7,000'—2" Black Pipe
500'—4" Black Pipe
313—Mine Fans from 30" to 8' Hi Pressure
108—Coal Drills, 57ICP, 572CP, 573CP, 473CP, A6 and A7 Jeffrey
3—Sullivan Jumbo Drills, track mounted
1—WK29 Sullivan Air Compressor, 120 cu. ft. capacity, 48" t.g.
2—Centrail Compressors, 125 cu. ft. capacity, 48" t.g.
1—Canton Track Cleaner, presently 48" t.g.
6—Cleveland Stapers
13—Scales for Mine Trucks
22—Air Compressors of various sizes
11—Rubber Dusters up to 30 h.p. track and rubber mounted
1400—Edison Lamps, Model P & R4
57—Auto Starters from 3 h.p. to 100 h.p.
1—Dust Collector for Roof Bolting

SHOP MACHINERY: Lathes, Drills, Grinders, Welders, Shapers, Planers, Presses, Milling Machines
We have thousands of dollars worth of parts for the equipment listed herein.

ALL INQUIRIES WILL BE ANSWERED *PROMPTLY*—Call, Write or Wire us, Day or Night

ELECTRIC & MACHINE SUPPLY COMPANY
MINING AND INDUSTRIAL EQUIPMENT

WHITESBURG, KENTUCKY
BOX #610, Ph. #2223 TWX #8249
NIGHT PHONES—2234 or 2347
BILL CONLEY, LEONARD NEASE

GLENN J. GOODING
2745 EMMONS AVENUE
HUNTINGTON, W. VA.
PHONE—JA 3-1240
MELVIN ADAMS

CLARKSBURG, WEST VIRGINIA
BOX #227, Ph. #MA 3-0253 TWX #CB8259
NIGHT PHONES—VI 2-2776 or MA 2-6338
HANK UBBING, GORDON STAFFORD

1201 Combination Shovel and Dragline Serial No. 12-1613. Standard Shovel Front. Machine Completely Rebuilt, Nov. 1957 New Cummins R. L. Diesel Engine. Not used after being rebuilt. Price Cash. $40,000. Shovel Front only $4,500

McCarthy Horizontal Bank Drill. Self propelled New Engine. Machine Excellent Condition. Price $2,500.00

Compton Coal Auger Model 26 Serial No. 7-1055-071-P 160 ft. 26" Augers. Excellent Condition. Price $30,000

Chicago—Pneumatic Air Compressor 110 C.F.M. Practically New. Price $1500
Allis-Chalmers Road Patrol. Tandem drive Model A. D. 5. Good Condition. Price $1500. Located Portersville, Pennsylvania.

W. R. WINTERS c/o Laura Andreas
Room 930 Boatmans Bank Bldg.
314 North Broadway St. Louis, Mo.
Phone: Chestnut 14471

7 yd. PAGE, walker
perfect condition
New Bucket
SERODINO, INC.
8176 Vine St., Cincinnati 16, Ohio
VAlley 1-3161

BUCYRUS 320-B 10 yd. bi-lift shovel.
MARION 7400 dragline (2) elec.-diesel, 12½ yd.
BUCYRUS 750-B 20 yd. strip shovel.
PAGE 625 walker drgln., 6 yd. diesel (2).
BUCYRUS 9W walker drgl. diesel 12 yd.
DRYERS (5) rotary, steam tubes, 6'x50'.
LOCOMOTIVES (18) diesel, 5 to 100 tons.
WHIRLEY gantry cranes (3) 30-65 tons.
EUCLID 25 yd. motorized scrapers (10).
H. Y. Smith, 628 N. B'way, Milwaukee 2, Wis.

New & Rebuilt
MOTORS • GENERATORS
TRANSFORMERS • SWITCHGEAR
— L. J. LAND, INC. —
Send for Free Listing
P. O. Box 756X, Reading, Pa.
Phone Franklin 5-8474

Watch—
the *Searchlight Section*
for
Equipment Opportunities

GOOD MINING EQUIPMENT - - - - - - IS A GOOD INVESTMENT

There is *No Magic* in the Used Equipment Business—you get only what you pay for.
No Price is low . . . . . If Quality is Gone
The Items listed below are exactly as represented
We Originate Others Imitate

3—Joy 14BU Loader, low pedestal, 7AE.
3—Joy 14BU Loaders, medium pedestal, 7RBE.
1—Joy 14BU Loader, high pedestal, 7BE.
2—Joy 12BU Loaders, 9E, latest type.
1—Joy 12BU Loader, 220 volt AC.
1—Joy 20BU Loader, latest type.
1—Joy 11BU Loader, latest type.
2—Joy 8BU Loaders, 250 volt DC.
1—Joy 8BU Loader, 34" overall height.
2—Joy 8BU Loaders, 220 volt AC.
1—Joy curved Bar Head, complete.
4—Reliance 38-J Motors.
6—Reliance 24-J Motors, 7½ H. P.
4—Reliance 10-J Motors, 3 H. P.
3—Reliance 15-J Motors, 7½ H. P.
20—9-J Motors, 4 H. P.
6—New Wheel Units for Joy 6SC Shuttle Cars.
1—Goodman 660 Loader on cats, excellent.
1—Goodman 665 Loader on cats, latest type.
1—Goodman 865 Loader, 26" high.
2—Joy 8SC Shuttle Cars, rebuilt.
2—Joy 6SC Shuttle Cars, rebuilt.
2—Joy 5SC Shuttle Cars, rebuilt.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars, rebuilt.
2—Joy 32E15 Shuttle Cars, rebuilt.
1—Joy 32E16 Shuttle Car, rebuilt.
2—Joy 42E16 Shuttle Cars, rebuilt.
3—Joy CD-22 Drills, like new.
4—Joy T-2-5 low pan Cat Trucks.
1—Joy T-2-6 low pan Cat Truck with reel.
2—Joy T-1 Standard Cat Trucks, 220 AC.
1—Joy T-1 Standard Cat Trucks, 250 DC.
2—Joy 11-B Cutting Machines, like new.
1—Joy 7-B Cutting Machine, like new, 250 volt DC.
2—Goodman 212 Cutting Machines, 19" high.
4—Goodman 312 Cutting Machines, 17" high.
3—Goodman 412 Cutting Machines, 19" high.
2—Joy 7-B Cutting Machines, 220/440 volt AC.
1—Goodman Machine on Cars, 31" high. All hydraulic.
6—Goodman 512 Machines with Bugdusters.
1—Goodman 512 Cutting Machine, perfect.
4—Goodman 512 Cutting Machines, 220/440 volt AC.
3—Goodman 112 Cutting Machines, 220/440 volt AC.
1—Lee Norse low vein Machine Carrier on rubber.
1—Jeffrey 70 URB, rubber tired Cutter, Universal head, perfect condition.
1—Joy 10RU Rubber Tired Cutter, first class.
1—Joy 11RU Rubber Tired Cutter, with bug-duster, Universal head, like new.
1—Sullivan 7AU on rubber.
2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on cats, 250 volt DC.

LOCOMOTIVES

1—Goodman 6 ton, 91-A, 27" high, armor plate frame.
2—Jeffrey, 13 ton, type MH-110, 36", 42" and 44" Ga.
2—Jeffrey, 10 ton, type MH-110, 42" and 44" Ga.
1—Jeffrey MH-124, 6 ton, 24" overall height.
12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" Ga.
2—Jeffrey, 8 ton, type MH-100, 2" armor plate frames.
1—Jeffrey, 6 ton, type 2186, 22" above rail.
3—Jeffrey, 4 ton, type MH-96, 42", 44" and 48" Ga.
1—G. E., 4 ton, type 825 Locomotive, 22" high.
10—G. E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
1—G. E., 8 ton, type 822 Locomotive, 44" Ga.
3—G. E., 10 ton, type 809 Locomotive, 42", 44" and 48" Ga.
2—Goodman, type 33, 6 ton, 44" and 48" Ga.
3—Goodman, 8 ton, type 32A, 36", 44" and 48" Ga.
3—Westinghouse, type 902, 4 ton, 42" and 48" Ga.
2—Westinghouse, type 904, 6 ton, 44" and 48" Ga.
2—Westinghouse, type 906, 44" and 48" Ga.
2—Westinghouse, type 907, 44" and 48" Ga.
8—Jeffrey MH-78 Locomotive Units, cheap.
3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" Ga.
4—Jeffrey MH-88 Locomotive Units, real bargains.
6—Jeffrey MH-100 Locomotive Units, reasonable.
Locomotive Trucks and Spare Armatures for all the above.

TIPPLE EQUIPMENT

1—Cedar Rapids portable super Screening Plant.
1—Complete 5 track tipple with washer.
1—Allis Chalmers 5' x 14' Rippfle Vibrator.
1—5' x 14' Robins double deck Vibrator.
1—4' x 10' Robins Gyrex Vibrator.
1—Roberts & Schaeger tandem Hydro-Separator Belt Loading Booms
1—Robins Car Shakeout.
10—Crushers, various sizes.
Feeders, Drag Conveyors and Loading Booms.

CUTTING MACHINES

1—Joy 11RU, rubber tired, Cutter.
1—Joy 10RU, rubber tired, Cutter.
1—Jeffrey 70 URB Cutter, rubber tired, Universal Head, low vein.
2—Jeffrey 29UC Universal Machines on Cats.
1—7AU Sullivan on rubber.
1—Goodman on cats, 31" overall height.
3—Baby Goodman 212's, rebuilt, 250 volt DC.
2—Goodman 212 Cutting Machines, 19" high.
4—Goodman 312 Cutting Machines, 17" high.
3—Goodman 412 Cutting Machines, 19" high.
4—Goodman 312's, 17" high.
6—Goodman 512's with Bugdusters, like new.
4—Goodman 512's, rebuilt, or as removed from service.
4—Goodman 512's, 220/440 volt AC.
3—Goodman 112's, 220/440 volt AC.
2—Joy 7-B Cutting Machines, 220/440 volt AC.
2—Joy 11-B Cutting Machines, rebuilt.
6—Goodman 12AA's and 112AA5s, 250 volt DC.
2—Goodman 324 Slabbers.
2—Goodman 724 Slabbers.
6—Jeffrey 35L's, like new, 17" high.
2—Jeffrey 35L's on low vein trucks.
15—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
2—Jeffrey 29C's, track mounted.
2—Jeffrey 29L's on track, perfect.
3—Sullivan CE7, 220 volt AC.
2—Sullivan CR-10's, 15" high.

LOADING MACHINES

6—Joy 12BU with Piggy-Back Conveyors.
16—Joy Loaders, all types.
1—Goodman 865 Loader, 26", on cats.
1—Goodman 665 Loader, on cats.
1—Goodman 660 Loader, on cats.
1—Goodman 460, rebuilt.
2—Jeffrey 61 C18's, on rubber, 26".
3—Jeffrey L-500 Loaders.
2—Myers Whaley No. 3 Automatic Loaders.
2—Clarkson Loaders, 26" above rail.

CONVEYORS

2—Joy 30" Underground Belt Conveyors, 500' to 2000' each. Excellent.
2—Goodman 97-C, 30" Conveyors, 1500' long.
1—Barber-Greene 30" Belt Conveyor, 350', Excellent.
1—Robins 30" Belt Conveyor, 500'.
1—Jeffrey 52-B, 26" Conveyor, 1200' each.
1—Jeffrey 52-B, 30" Drive and Tail Assembly, Complete.
3—Robins 26" tandem drive Belt Conveyors, 1,000' to 2,000' long. Excellent condition.
2—Joy MTB 30" Drive and Tail Assembly, complete.
3—Goodman 97 HC 30" Drive and Tail Assemblies, complete.
8,000' Conveyor Belt, 30".
10,000' Conveyor Belt, 26", like new.
2—61EW Elevating Conveyors.
2—61WH 15" Room Conveyors, 300'.
2—Joy 15" Room Conveyors, 300'.
2—Joy 20" Conveyors, 300'.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.

CONVERTERS AND DIESEL PLANTS

2—100KW, G.E. TCC-6's, 275 volt, Rotary Converters.
1—150KW, G.E. HCC-6, 275 volt, Rotary Converter.
1—150KW, 6 phase, Allis Chalmers Rotary Converter, 275 volt DC.
1—200KW Allis Chalmers Rotary Converter, 6 phase, 275 DC, perfect.
1—200KW, G.E. HCC-6 Rotary Converters, 275 volt DC.
1—300KW, G.E. HCC-6 Rotary Converter, 275 DC.
2—300KW Westinghouse, 6 phase, Rotary Converters, 275 volt DC.
2—500KW Westinghouse Rotary Converters, 275 volt DC.
2—200KW Westinghouse Rotary Converters, 275 DC.
(all the above with 6900/13000 and/or 2300/4000 primary transformers)
2—150KW MG Sets, General Electric and Westinghouse.
1—200KW MG Set, Westinghouse, rebuilt.
1—200KW MG Set, General Electric, perfect.
2—150KW Allis Chalmers MG Sets, 275 DC volt, excellent, 220/440 AC volt.
1—300KW Westinghouse, 600 volt MG Set, rebuilt.
2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
2—500KW Westinghouse, 600 volt, DC, 6 phase, Rotary Converters.
2—500KW HCC-6 Rotary Converters, 6 phase, 600 volt DC.
1—Cummins 125 KW, Diesel with 250 volt DC Generator.
1—Allis Chalmers Natural Gas Engine with 100KW Generator, 275 volt DC.
1—700 H.P. Shaft Hoist, complete.
Complete steam plant, will sell all or any part. Boilers, like new, 1100 H.P. and 500 H.P. Also transformers, turbines, etc.
1—Complete Tipple with Cleaning Plant.

MISCELLANEOUS

20—Jeffrey Molveyors on rubber tires.
1—¾ Yard Shovel and Back-Hoe.
1—¾ Yard Crane on Cats.
Battery Supply Tractors, rubber tired.
1—Centrell Air Compressor on rubber tires.
10—Air Compressors, 1 H.P. to 40 H.P.
2—Joy self propelled rubber tired compressors, 240 cu. ft.
2—Acme self propelled rubber tired compressors, 130 cu. ft.
40 Mine Pumps, all types.
1—Differential 40 Passenger Man-Trip Car.
6—MSA Rock Dusters.
2—Phillips Carriers, 44" and 48" Ga.
2—Barber Greene self propelled Bucket Elevators.
Pine, Plastic, Steel, Transit, all sizes 1" to 6".
100 Mine Cars, drop bottom, 42" Ga.
30 Mine Cars, drop bottom, 44" Ga.
100 Mine Cars, 18" high, end dump, 44" Ga.
300 Mine Cars, end dump and drop bottom, 20" high, 48" Ga.
1—10 ton Mine Car Scale with Recorder.
15—Brown Fayro HKL and HG Car Spotters.
1—12 ton Differential Slate Larry.
Incline Hoists, 25 to 50 H.P.
1—Jeffrey 5' Aerodyne Fan, like new.
1—Jeffrey 6' Aerodyne Fan.
1—Jeffrey 8' Aerodyne Fan.
2—Storage Tanks, 4,000 Gallon.
1—Storage Tank, 10,000 Gallons.
10,000 Five Gallon G. I. Cans, screw lids.
800 tons Relaying Rail 25# to 80#.
10 tons Copper Trolley and Feeder.
300 Transformers from 1 to 2,000 KVA, 110 to 13,000 primary volts.
400 Electric Motors, 3 to 250 H.P.
Huge stock of mine supplies.
Thousands of Other Items.
600—MSA Mine Lamps, Chargers, etc.
1—Fricke Saw Mill—Complete.

WE BUY—SELL—TRADE

PHONE 2825 **J. T. FISH** **LOGAN, W. VA.**

POWER EQUIPMENT CO. Offers

BARGAIN PRICES

ON GUARANTEED NEW and Rebuilt MOTORS!

JANUARY SPECIALS

Guaranteed Rebuilt Motors
230 Volt-DC- Compound Wound Unless Otherwise Noted

HP	Make	Type	Speed
125	Reliance TEFCBB	2550F	900
60	G.E.B.B. Drip	CD-96	1800
45	G.E.S.B. Open, Shunt	RC-14	1200
40	Century B.B. Drip—New	DN-375	1800
40	West S.S.B. Open Shunt	SK-120L	1200
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***Indicates more product information may be found in company advertising appearing in COAL AGE 1958 Mid-July Mining Guidebook and Buying Directory Issue. Check your Guidebook index.**

Allis-Chalmers Manufacturing Co. 57
*ACF Industries Inc., American Car & Foundry Co. ..... Third Cover
American Oil Co. 47
*American Pulverizer Co. 108

Bemis Bro. Bag Co. 37
Bethleham Steel Co. 10, 80, 109
Bird Machine Co. 4
Bixby-Zimmer Engineering Co. 42
*Bowdil Co. 65

Caterpillar Tractor Co. 58–59
*Compton Inc. 6
Connellsville Manufacturing & Mine Supply Co. 136

*Denver Equipment Co. 21
Detroit Diesel Engine Div., General Motors 33, 34–35, 36
Differential Steel Car Co. 134
Dodge Div., Chrysler Corp. 64
Dodge Manufacturing Co. 103
Dorr-Oliver Inc. 14–15
Dravo Corp. 94
du Pont de Nemours & Co., E. I. (Explosives Div.) 81
Durakool Inc. 56

Ensign Electric Manufacturing Co. 137
*Exide Industrial Div., Electric Storage Battery Co. 127

Firth Sterling Inc. 61
Fletcher & Co., J. H. 20
Flexo Products Inc. 102
*Flood City Brass & Electric Co. 44
Ford Motor Co. 52–53

Goodman Manufacturing Co. 13
Goodrich Industrial Products Co., B. F. 1
Goodrich Tire Co., Div. B. F. Goodrich Co. 125
Gundlach Machine Co. 138
Guyan Machinery Co. 54, 132

Hamilton Rubber Co. 51
*Hendrick Manufacturing Co. 46
*Heyl & Patterson Inc. 39

International Harvester Co. (Payhaulers) 88–89
International Salt Co., Inc. 132

Jeffrey Manufacturing Co. 40–41
*Joy Manufacturing Co. 2–3, 60

*Kennametal Inc. 43
Kersey Manufacturing Co. 19

Lee-Norse Co. 24–25
*Leman Machine Co. 101
LeRoi Div., Westinghouse Air Brake Co. 68
*LeTourneau-Westinghouse Co. 121, 123
*Link-Belt Co. ..... Fourth Cover
*Ludlow-Saylor Wire Cloth Co. 32

Macwhyte Co. 27
Manhattan-Rubber Div., Raybestos-Manhattan Inc. 18
*Manitowoc Engineering Co. 12
Marietta Concrete Corp. 60
Marion Power Shovel Co. 16
*McLanahan & Stone Corp. 135
*McNally Pittsburg Manufacturing Co. 126
Metal Carbides Corp. 102
*Mine Safety Appliances Co. ..... Second Cover

*National Malleable & Steel Castings Co. 29
National Mine Service Co. 62–63
New York Rubber Co. 129
*Nolan Co. 54

Ohio Brass Co. 115
Okonite Co. 55

PLM Products Inc. 128
Porter Co., Inc., H. K. Connors Steel Div. 131
Post-Glover Electric Co. 130

Roebling Sons Corp., John A. 95

Sanford-Day Iron Works 48–49
Searchlight Section 139–143
Simplex Wire & Cable Co. 31
Spencer Chemical Co. 117
Stamler Corp., W. R. 79
Standard Oil Co. of Indiana 8

Thompson Products Inc. (Valve Div.) 50

Union Wire Rope Co. 66–67
United States Rubber Co. (Mechanical Goods Div.) 119

Vascoloy-Ramet Corp. 17
*Victaulic Co. of America 133

Westinghouse Electric Corp. 22–23
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp. 45
Wilcox Manufacturing Co. 38

PROFESSIONAL SERVICES 139

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 139

EQUIPMENT
(Used or Surplus New) For Sale 139–143

WANTED
Equipment 139

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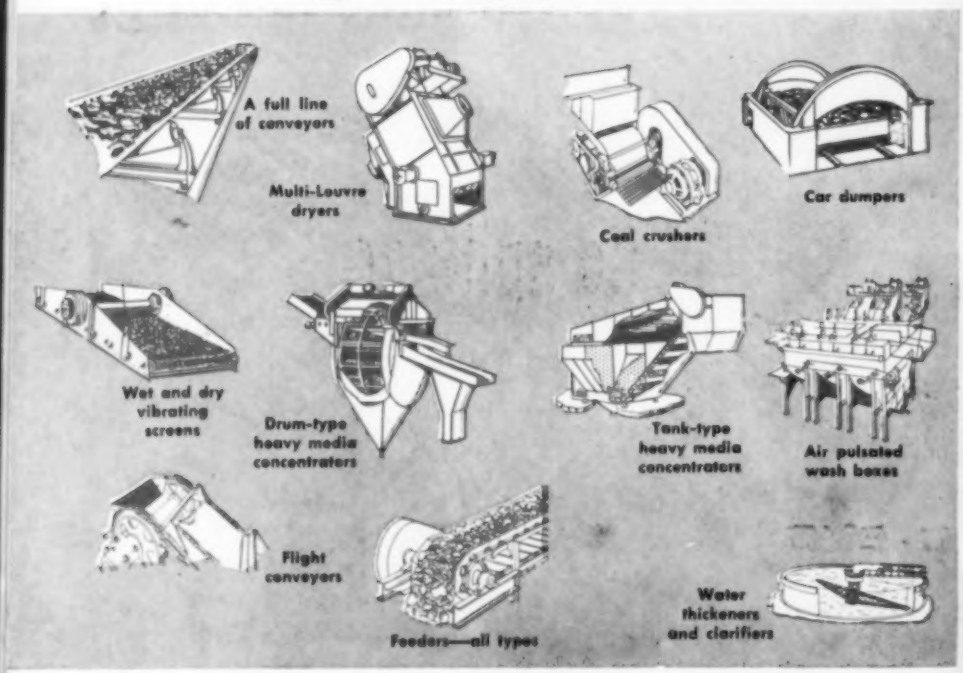

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